Special Report: The Tenth Anniversary of the Microcomputer

POPULAR COMPUTING®

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Steven Levy on the Fate of the New PCjr

Black Market Macs

Advanced Technology: Computer Illusions at Lucasfilm

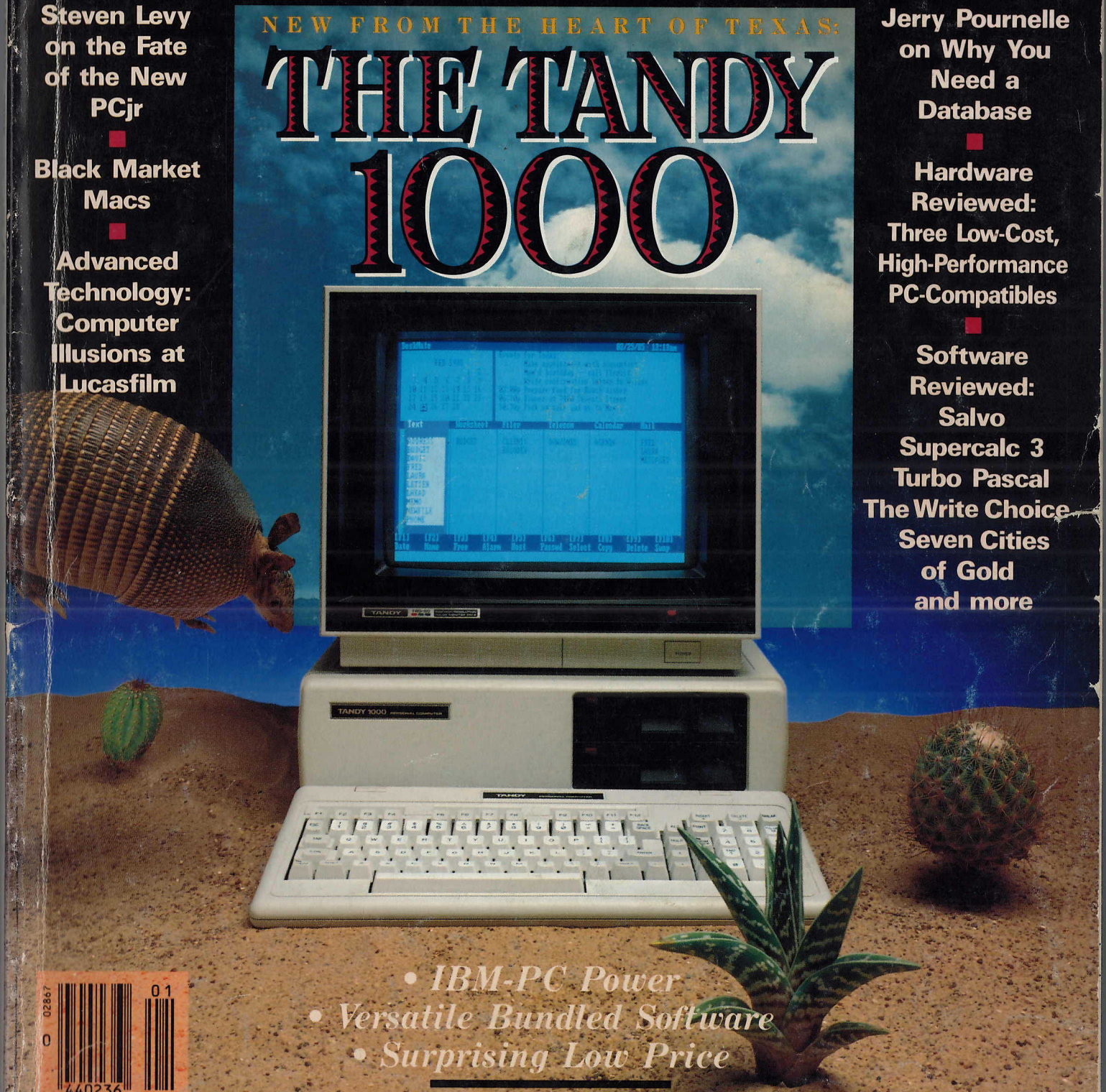
NEW FROM THE HEART OF TEXAS:

THE TANDY 1000

Jerry Pournelle on Why You Need a Database

Hardware Reviewed: Three Low-Cost, High-Performance PC-Compatibles

Software Reviewed: Salvo Supercalc 3 Turbo Pascal The Write Choice Seven Cities of Gold and more



• *IBM-PC Power*
• *Versatile Bundled Software*
• *Surprising Low Price*

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A BUREAUCRAT'S GUIDE TO WORD PROCESSING

Now, if it were you or I and we wanted a word processing program for our IBM-type PC, we'd probably stop off at our local computer store and simply diddle with a few.

You and I, however, are not the U.S. Department of Agriculture.

(Nor any of its permutations of subsystems like the Economic Research Service, National Resources Economics Division, Data Services Center, etc., etc.)

So when the USDA told ERS to tell NRED and DSC to look into a truckload of w.p. programs for all their PCs, the last thing they wanted was simple diddling. Their dedicated Wangs and Lexitrons were far too few to handle their needs, their IBM® PCs weren't compatible with them anyway, and nobody really, quantifiably, knew from word processing with a personal computer.

Definitely not a diddling-mode condition.

As they put it in The Exchange, an internally distributed publication of the Department of Agriculture: "A needs assessment showed that, in the long-term, a word processing system is needed that can increase word processing capability and also be compatible with ERS' Long Range Information Management goals."

Well. "Needs assessment" led swiftly to "procurement action," which galloped into an "objective review" of the eight top-rated PC programs on the market (as compiled by The Ratings Book published by Software Digest), along with Wordstar® and Display Write 2, because they had some around.

Thus armed with the names, the final evaluators (a team of secretaries from NRED who would be the primary users of the PC software) became armed with each of the programs, along with checklists to record such things as ease of use, advanced features, and similarity to their existing dedicated equipment.

The first to be eliminated from the prospect list were Office Writer™ and Samna,™ since they're copy-protected and couldn't be transferred to hard disks.

Next, IBM's Display Write 2: because it's "not compatible with other software used in ERS (like Lotus 1-2-3,™ dBASE II,® etc.)," and it's "full of confusing menu options and cryptic error messages." Au revoir IBM.

Then, three more, for a variet of reasons.

Which left the following:

Volkswriter® Deluxe™
MultiMate™
Leading Edge™

Volkswriter Deluxe? "Too complicated and confusing." Not "easy to learn or use."

MultiMate? Not bad. It actual tied the winner in a few categories

The winner being the one tha won 82% of the votes in the Ease of Use/Ease of Learning categorie The one about which they said, "The ability to store deleted text an automatic document backup features were both highly desirable." The one they thought they'd quick "be able to use . . . for their day-to day word processing tasks."

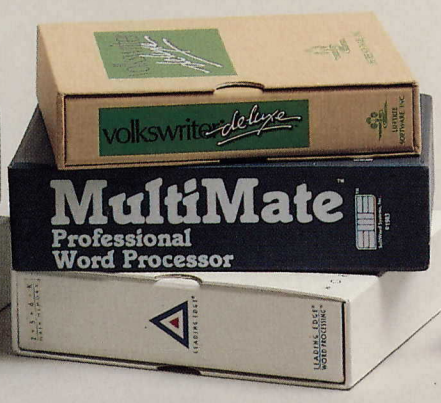
The whole process took som three months of work by people in DSC to support the NRED in its work with the ERS and DSC to make the world a better place for the USDA.

But the results were well worth the wait. Because at last they've solved their word-processing problems . . .

"With Leading Edge!"

THESE ARE THE PACKAGES THE COMMITTEE EVALUATED:

THESE WERE THE FINALISTS:



THIS WAS THE WINNER:
LEADING EDGE™
LEADING EDGE WORD PROCESSING

LEADING EDGE PRODUCTS, INC.
LEADING EDGE SOFTWARE DIVISION, 21 HIGHLAND CIRCLE, NEEDHAM, MA 02194, TEL. 800-343-3436, (617) 449-4655
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ALL YE NEED KNOW.

Like:

"How many boxes of 'Trivial Pursuit' we got left in the West Coast warehouse?"

"Mr. Jones, your expense account just set an IRS record. Can you explain how, where, and with whom you managed to spend $12,648 on 'client entertainment'? In one week?"

"Listen, Eddie, we own 1,400 stores, and you're telling me you can't find one lousy Cabbage Patch doll?"

"We got any dealers in New England with a new Chevy Citation on the lot in metallic silver, blue interior, and stereo with cassette deck?"

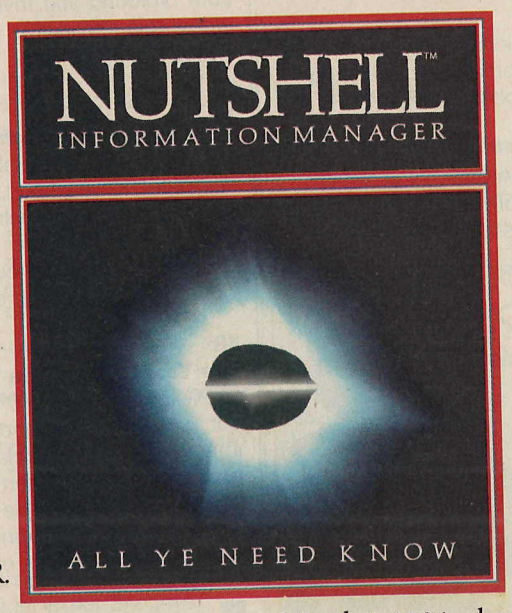
"Of all the furniture we sell, how many pieces in the $600 to $800 range haven't turned over this month?"

"I met this distributor in Chicago who wants to order a million units, and his name is McTavish or McCormack or McMurphy or McCarthy or something, and silly me, I lost the napkin I wrote his name on . . ."

And so on.

And so . . .

THE NUTSHELL™ INFORMATION MANAGER.



It stores and cross references any data your business depends upon—once an hour or once in a lifetime—and lets you get at it and use it in an instant.

It's an information-management software package created to take full advantage of all the power inherent—but until now never tapped—in sophisticated personal computers like an IBM® PC (upgraded to 256K) or a Leading Edge™ PC.

And it spans a major gap: Between toys that act like glorified file cabinets, on the one hand; and costly, complicated database management systems, on the other.

Now, the Nutshell™ doesn't pretend to give you all the information in the world. Just all the information you need, in any form you need it: inventory lists, invoices, sales reports, salary summaries, customer histories—with fields of virtually unlimited length—on the screen, or in printed reports.

To be sure, it's similar to a giant file cabinet. (In fact, depending upon your computer, its paper equivalent could be some 2 billion separate records, or 2 miles of printed information.) But there the similarities cease. Because you can access any data in any of those files by the most incredible cross-indexing system ever conceived for a PC. You can call up information by file name, date, prices, part number, manufacturer, description (like "red"), and a dozen other different ways in seconds.

Even if you forgot you had it.

Remember the incident concerning McTavish, McCormack, McEtc?

All you have to do is type in the first few letters of any name you want to recall (like "Mc") and every word in every file that starts with "Mc" pops up on the screen.

So you find "McGuire" and, along with his name, his million-unit order.

Where were you on that weird week of March 5, 1984 when you managed to expense $12,648? Type in 3/5/84 (or "$12,648" or "Polo Club"), and . . . here's your answer, Mr. Tax Man.

You can even selectively withhold certain information for display. (For example, you could show a customer every house your real-estate agency has for sale, without showing the owner's very lowest acceptance price.)

EASY TO DO. HARD TO DO WITHOUT.

Thanks to an instruction disk that leads you through practice lessons, and on-screen menus that let you choose what you want and tell you how to get it, the Nutshell is one of the easiest-to-learn programs ever designed.

And once you learn it, you'll never want to be without it.

LEADING EDGE™

Call or write now for your FREE Nutshell™ demo disk.
The only thing we'll need is the serial # of your IBM or IBM compatible machine.

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Software Division, 21 Highland Circle, Needham Heights, MA 02194, 800-343-3436, (617) 449-4655.

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SPECIAL REPORT: 10TH ANNIVERSARY OF THE MICRO

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Ed Roberts: The Father of the Personal Computer by Paul Freiberger—Ed Roberts launched his Altair personal computer 10 years ago, and much to his surprise, the response was overwhelming. He projected 800 sales the first year, and his computer manufacturing company, MITS, was doing a million-dollar business by the end of 1975. MITS is long gone, but not the computer revolution Ed Roberts began.

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Ten Years After: The Micro's Imprint on Society by Dan McNeill—In the last 10 years the microcomputer has affected our lives in obvious and hidden ways. The most apparent impact is in the workplace—computers have increased productivity and, in some cases, decreased jobs. In less visible—and measurable—ways, the computer is also reshaping our educational, economic, and social institutions, as well as our images of ourselves and the way we think.

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The Future of the Micro: Looking Ahead at the Next Decade by Pete Carey—Today's rapid technological advances indicate that the microcomputers of the 1990s will rival present minicomputers in memory, processing power, and speed. The range of applications possible with these desktop minis—home reference libraries and electronic babysitters, for starters—boggles the imagination.

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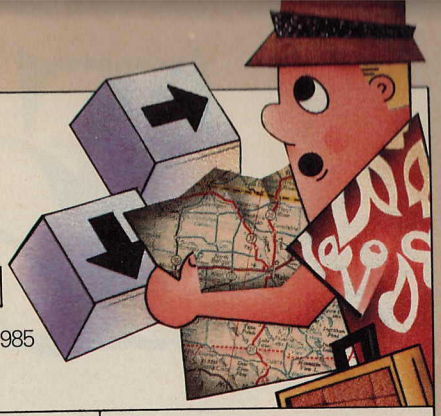
The Delicate Art of Digital Type by Doug Stewart—Eyestrain and headaches from staring at video type may soon go the way of polio and smallpox. In the dark, early days of computing, engineers designed video typefaces with clunky, poor-quality letters. But now professional typographers are making pixels more elegant and easier to read.



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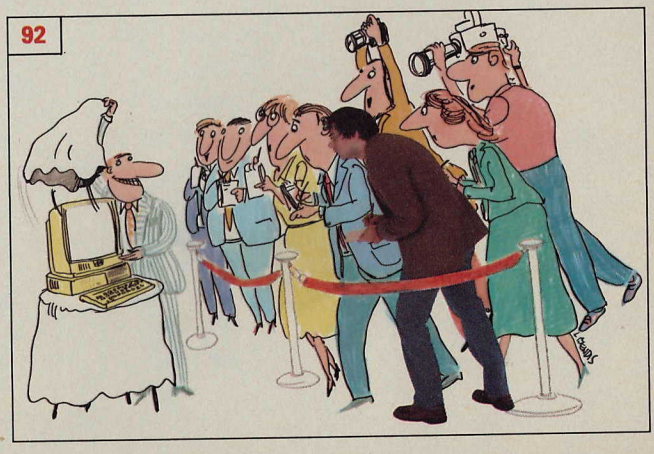
Tandy 1000: photograph by Elle Schuster



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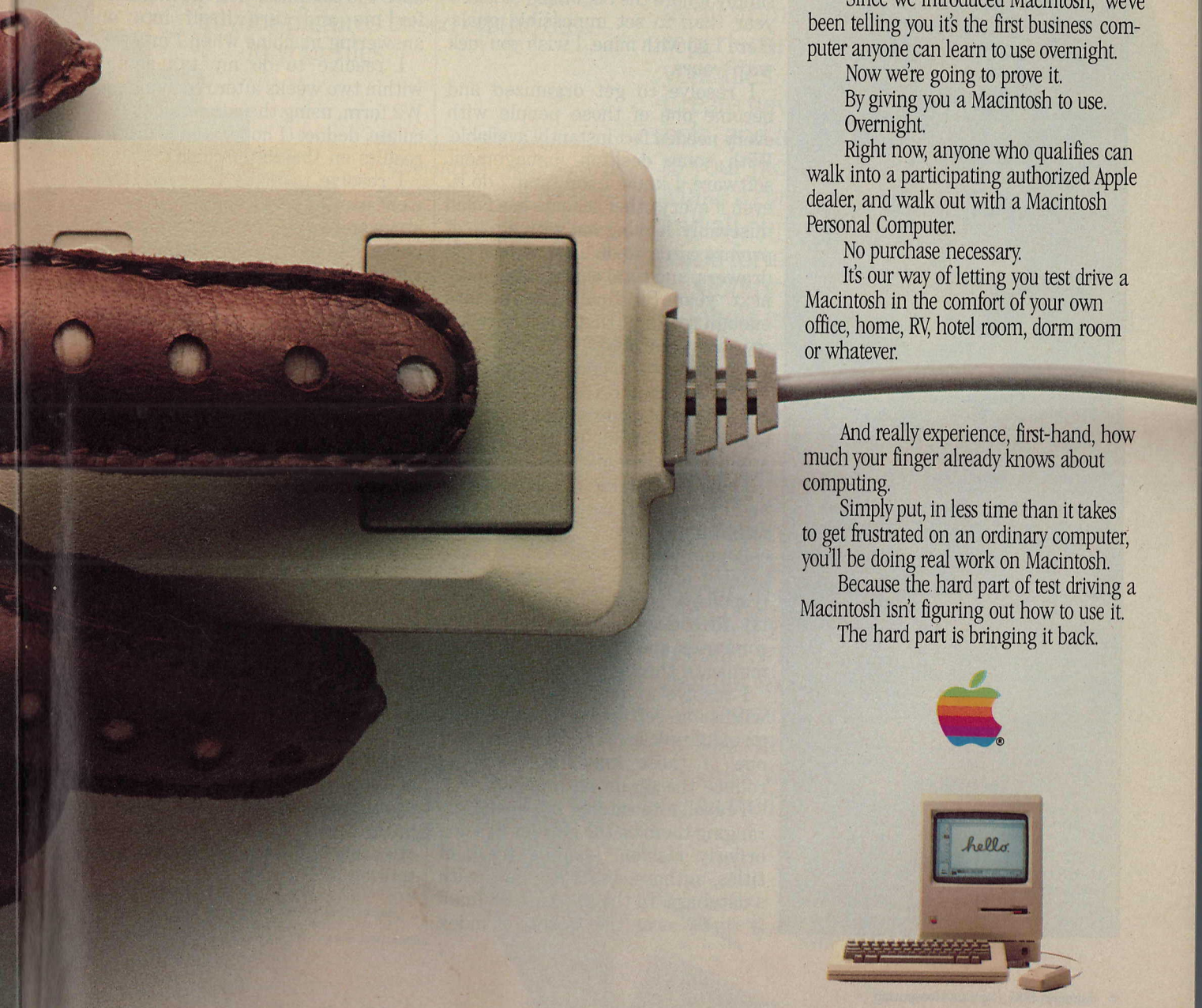

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It's our way of letting you test drive a Macintosh in the comfort of your own office, home, RV, hotel room, dorm room or whatever.

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The hard part is bringing it back.

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I Resolve to . . .

It's that time again. When the calendar pages are about to end, we're compelled to examine our successes and failures of the past year. With a determination born of perceived necessity, we compose a set of resolutions to make the next year a better one. Of course, most of the time, our efforts reveal more about the way we would like to see ourselves than the way we really are.

But as fruitless as the task may prove, it takes far more courage to simply ignore the beginning of a new year than to set impossible goals. Here I go with mine. I wish you luck with yours.

I resolve to get organized and become one of those people with every needed fact instantly available. With some desktop management software, I know I can finally do it, even if every other scheme has failed miserably, leaving me with a pile of prompt cards, to-do lists, several file drawers, and total chaos. Maybe by next year I'll finally be mature enough to admit that I really relish my disorganization.

I resolve to balance my budget. Both Reagan and I share this lofty goal. If one of those accounting packages works for me, perhaps he can apply it to the national debt.

I resolve to write letters to everyone I know. This task, dutifully promised to my parents when I left for college, remains undone. Word processing ought to make me a more responsive person. Of course I could try to convince everyone to get a computer and then we could communicate through electronic mail.

I resolve to get myself in shape, with some software to track a diet, an electronic log of my exercise, and one of those kneeling chairs to reduce the strain on my back.

I resolve to catalog my books, arranging them on the shelves in some orderly fashion, keeping track of titles, authors, and borrowers with a database. In the process, I'll finally throw away the 15 sets of index cards that serve only to remind me how many times I have already failed at this task.

I resolve to update my telephone/address file by putting the contents of five Rolodexes and two tattered spiral books into a combination communications and mailing program. I also resolve to keep that program up to date, get some skinny fanfold paper for printing out the file, and always be prepared with everyone's current phone number. I will also have the computer dial the numbers for me and turn itself into an answering machine when I'm away.

I resolve to do my tax return within two weeks after receiving my W2 form, using the computer to calculate, deduct (I hope), and print the results on the actual forms.

I resolve to make the most efficient use of energy sources, a woodstove and an oil furnace, by plotting costs, usage, and temperature ranges on a spreadsheet.

I resolve to commit my appointments and schedule to a software calendar so that I will know in an instant what meetings I just missed attending, what projects I never got to, and what little time remains for sleeping and eating.

I resolve to reduce my stack of paper reading by searching for information on on-line services, tracking every tiny bit of data about the subjects I'm most interested in. I'll need hard copy of much of this, so a few extra file cabinets wouldn't hurt. After all, you still can't scribble FYI on a piece of data.

I resolve to consider carefully my hidden resolution and my reluctance to share it with the public. What would the reaction be if I simply said, "The only reason I produced all of these resolutions was to justify spending more time with my computer"? In fact, that's probably the only resolution I really have any intention of keeping.

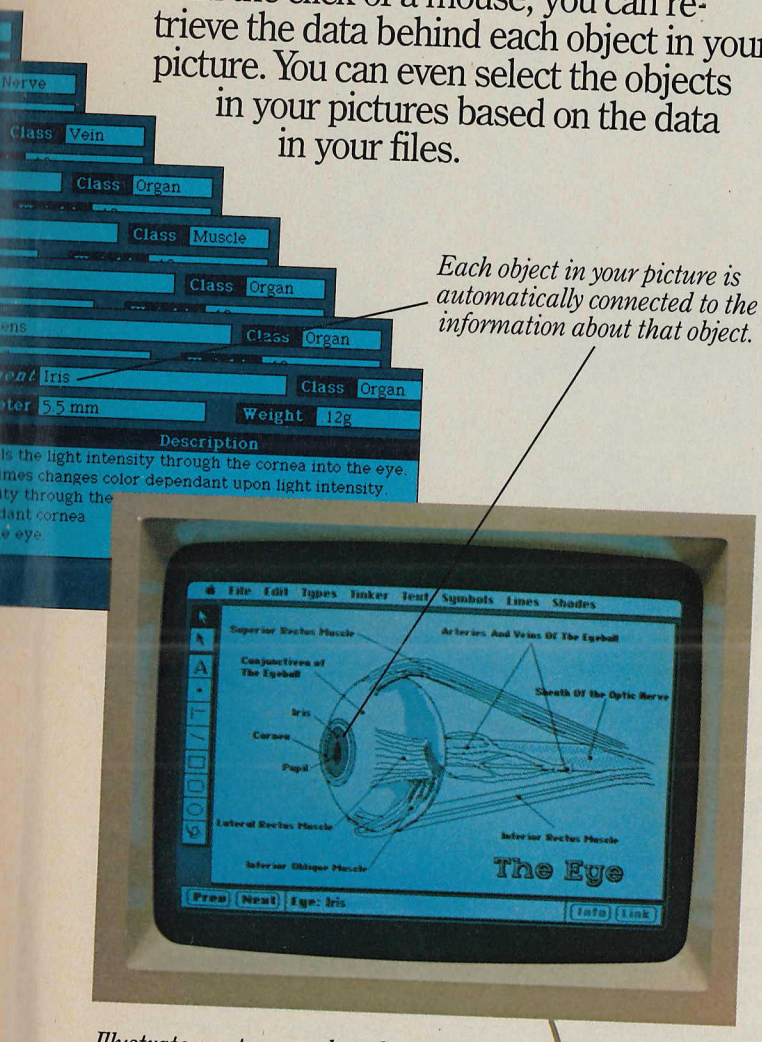
Pamela Clark

Introducing Filevision™ for Macintosh™. The fine art of filing by pictures.

Filevision. The first software that combines a practical filing system with a simple-to-use, object-oriented drawing system. It lets you file things the way you see them. And quickly visualize your data in pictures. Instead of sorting through tedious line-by-line listings.

To use Filevision, you simply place objects in a picture, or choose from the ready-made symbol menu to represent the pieces of information you wish to file.

In the click of a mouse, you can retrieve the data behind each object in your picture. You can even select the objects in your pictures based on the data in your files.



Each object in your picture is automatically connected to the information about that object.

Illustrate anatomy and study physiology. Map sales territories and track volume. Seat a convention and highlight non-smokers. Filevision pops requests right off the screen. In the click of a mouse.

Each object is automatically connected to a data form. Which you custom design, quick as a click.

For a change, it's simple to modify my files.

Updating your files is just as easy. Whenever the best-laid plans of mouse and man need a little replanning, you're just a click or two away from reperfecting your files.

Create new symbols, and add them to your picture. Make a data form for any new object, and all objects of that type will have the same form. Automatically.

Modify a symbol, and all matching symbols in your picture will be modified. Automatically.

Change an existing form, and all forms of that type will change. Automatically.

The possibilities are endless. Filevision can study anatomy while fleshing out the physiology, peek at the population behind a map, show a business person just what's in stock, or lay out an office and see who's got what. In fact, if you can see it, you can file it visually with Filevision. And retrieve it visually, too.

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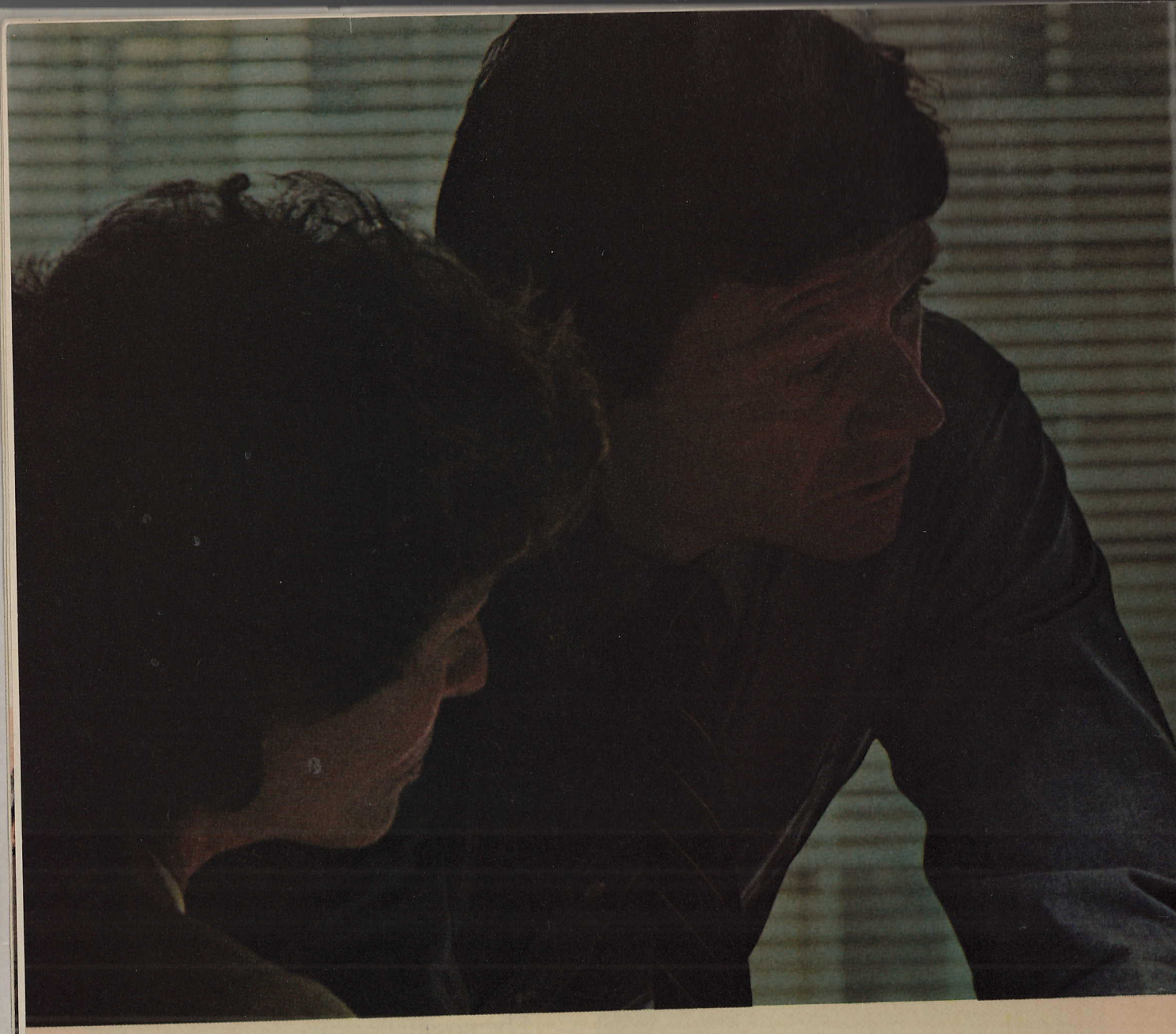

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When it comes to communicating—computer to computer—Hayes says it best. All you need is a Hayes Smartmodem (it's like a telephone for your computer) and Smartcom II® software, to get you into all the right places.

In no time at all, and with no assistance at all, you can create, send and store files, and automatically log on to information services. The communication possibilities are endless!

Introducing our new Smartcom II. More connection capabilities. More convenience.

Now Hayes goes even further to streamline your communications and optimize your connections.

Smartcom II software is currently available for more than 21 personal computers (with even more to come). That means you can communicate, Smartcom to Smartcom, with an IBM PC and IBM PC AT, AT&T 6300, COMPAQ* and others.

And that's not all! Smartcom II also emulates the DEC* VT52 and VT100/102, now in widespread use in many businesses. This feature lets your personal computer "pretend" it's a DEC terminal, opening the door to a vast installed base of DEC minicomputers!

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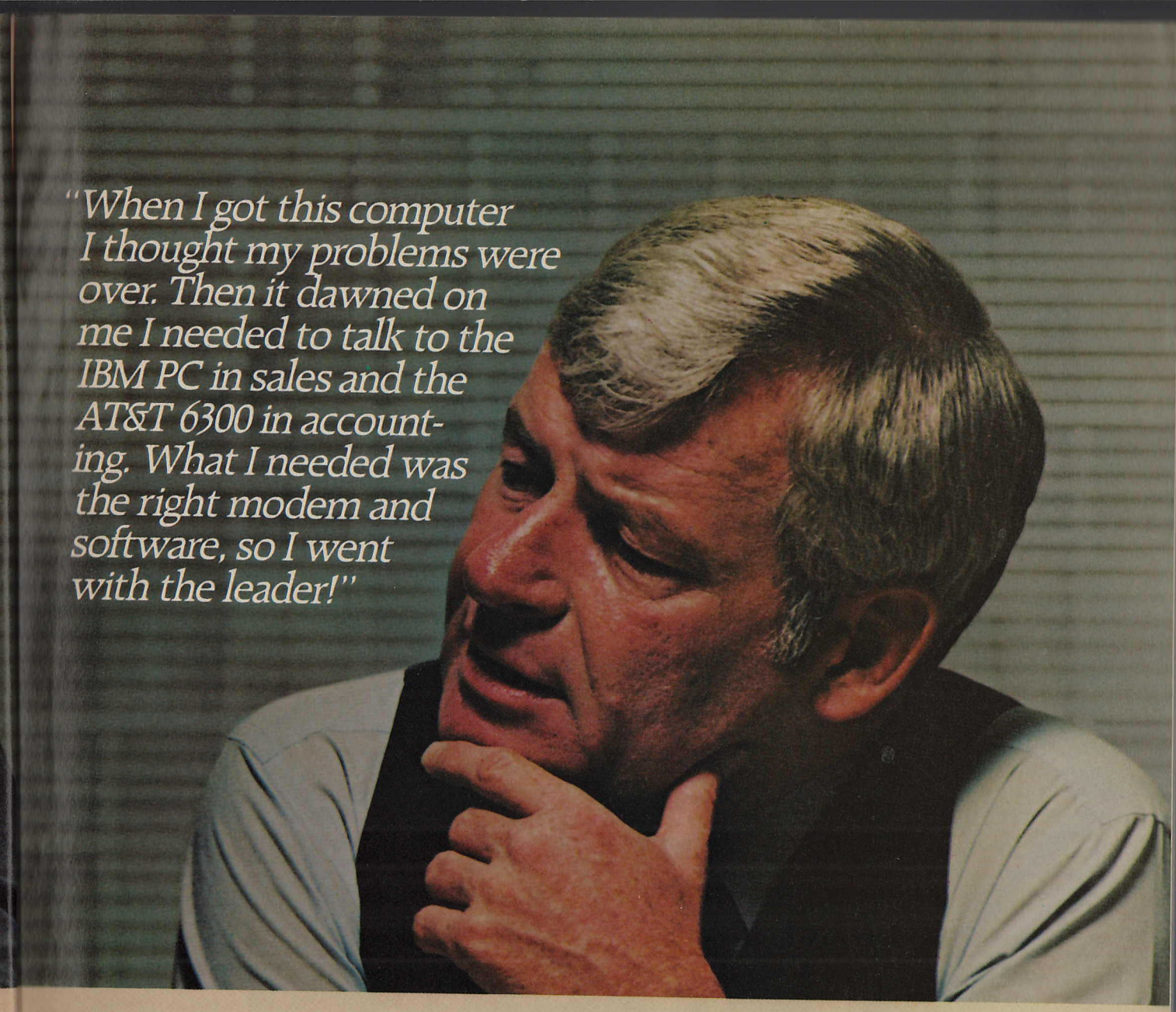
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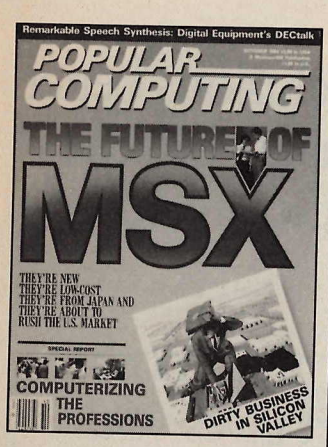
LETTERS



Data vs. Datum

Dear Editor:

I was sorry to see your rather tame response (Letters, October issue) to the letter from the biology professor who scolded you for your "misuse" of the word "data," which he insists is a plural noun. The fact of the matter is that he, like many pedants, confuses Latin with English.

The problem goes back many centuries to the classical education of the English "gentleman," who was taught to revere the purity of Latin and its superiority to vulgar English. Thus we get such nonsense as the supposed rule against splitting infinitives: because the infinitive is a single word in Latin and thus *cannot* be split, the pseudo-grammarians decreed that correct (i.e., Latin-like) English should also contain no split infinitives.

It's really nothing but a silly form of snobbery and Professor Zar should know better. The fact is that *datum* is a singular Latin noun (plural: *data*), while "data" is a perfectly correct *collective* noun in English, like "mud" or "sand."

Because information, as a concept, fits the general pattern of collective nouns, native English speakers long ago borrowed the Latin word *data* (plural) and transformed it into the English word "data" (collective singular). The natural equivalent of *datum* is "piece of data," just as we speak of a "grain of sand" or a "bit of mud."

Professor Zar can go around speaking Latin as much as he wants, but he really should get his *facta* correct. Meanwhile, I'm glad *Popular Computing* continues to be written in English.

Draper Kauffman, EdD
Houston, TX

Dear Editor:

I am appalled at your response to Professor Zar's complaint about the grammatical sloppiness in the computer industry. You are losing an opportunity to light a candle in the darkness.

Why not set an example and use proper grammar as a *criterion* for utilization of this *medium* of communication? Maybe by your example documentation will emerge from this crippling informality, as you call it, of mixing singulars and plurals interchangeably.

I hope you are neither content with your current usage of the words nor concerned that readers will fail to understand correct grammar. Don't permit our language to degenerate by default.

Gunars Graudins
Lincolnshire, IL

Dear Editor:

Regarding the letter from Professor Zar concerning your ungrammatical use of data/datum.

Just because you view *Popular Computing* as nonscholarly is no reason to let poor grammar leak into the budding world of personal computing. Fie on you. If you cannot live up to the standards of the fifth estate [*sic*], perhaps you should consider leaving it. If your shoddy editorial policy continues, I shall cancel my subscription and urge all my students to do likewise.

Frederick J. Rayfield, PhD
President and Associate Professor of Psychology
Roosevelt University
Chicago, IL

Wall Street Software

Dear Editor:

As a fan for some time of both Justin Mamis and *Popular Computing*, I was pleased to read his software review in the October issue (page 181). Finally, someone is saying what I have been discovering for the last year—that using most software aimed at Wall Street is no better than tracking the market manually. I have yet to find a technical system that is more cost-effective than commercially available charts, and only recently, after a lot of searching, was I able to find a decent program for portfolio tracking: Portfolio Evaluation And Review (PEAR). Congratulations for bucking the trend in assuming that if a Wall Street program exists on a disk, it must therefore be better than doing it manually.

Daniel Turov
Senior Vice President
Investments
Dean Whitter Reynolds Inc.
New York, NY

Apple III Fans

Dear Editor:

I thank you and A. Richard Immel for the article on the demise of the Apple III in your October issue (page 43). I'm one of that "small but intensely loyal band of owners" Immel refers to in his article, and for the record I'd like to clarify the reasons for, and the limits of, my loyalty.

Like many other III owners, I've used a large number of microcomputers in my work—the TI Professional, the Zenith, the Apple IIe, and (God help us!) the IBM PC. Not one of them approaches my Apple III in versatility, speed, available memory, or "friendliness."

Because of its operating system, I can write a text file with my word-processing program and use that file in either a Pascal or a BASIC program. Try that with your IBM or IBM clone. In fact, I can even write the Pascal or BASIC program itself on my word processor. And the BASIC program I write can access 205K bytes of available memory, while the "256K" IBM at my office can access only 64K bytes in BASIC. (Isn't that 8088 chip great?)

But my loyalty does not extend to Apple itself. Why should I be loyal to a company that has abandoned me? With the advent of the IIe and the IIc, neither of which shows any great improvement over the II or the II Plus, it's fairly evident that you can take Apple out of the garage, but you can't take the garage out of Apple. I'll use my III until it goes up in smoke. And when it does, you can bet that I won't replace it with another Apple.

Take this, Jobs, and shove it!

Robert Boston
Ames, IA

Dear Editor:

"The Unpicked Apple" in your October 1984 issue proved to be a mixed blessing. It confirmed my suspicion that the Apple III has indeed fallen out of favor within the firm, but it also provided a lead to a source of information for Apple III owners: *On Three*.

Being the proud owner of an Apple III, I am consistently seeking publications tailored to this model's owners. Please provide more information about *On Three*.

Robert P. Zimmel

← On AIMS/inquiry card 3

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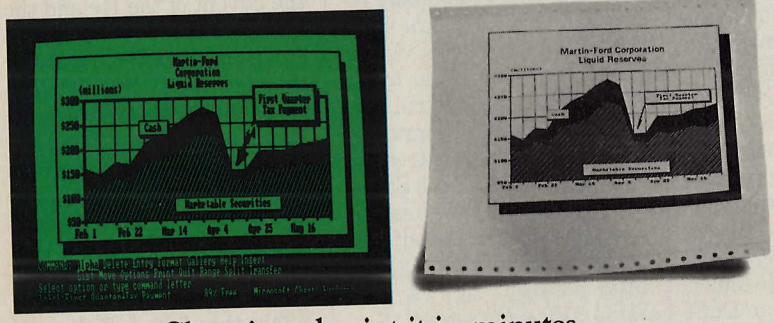

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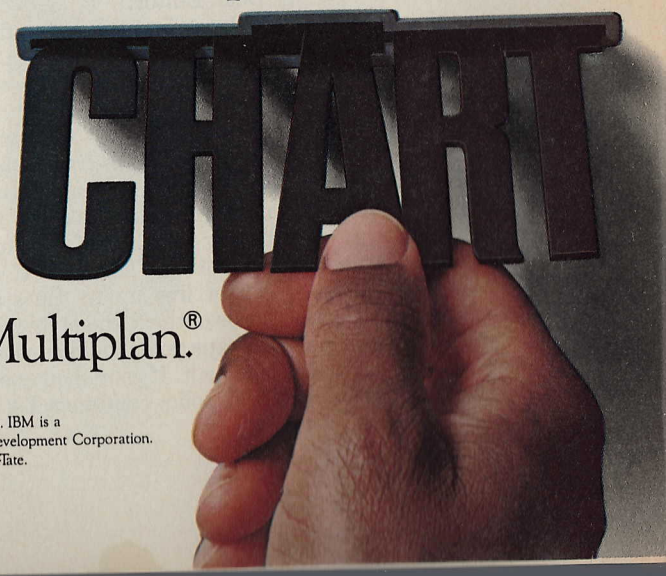

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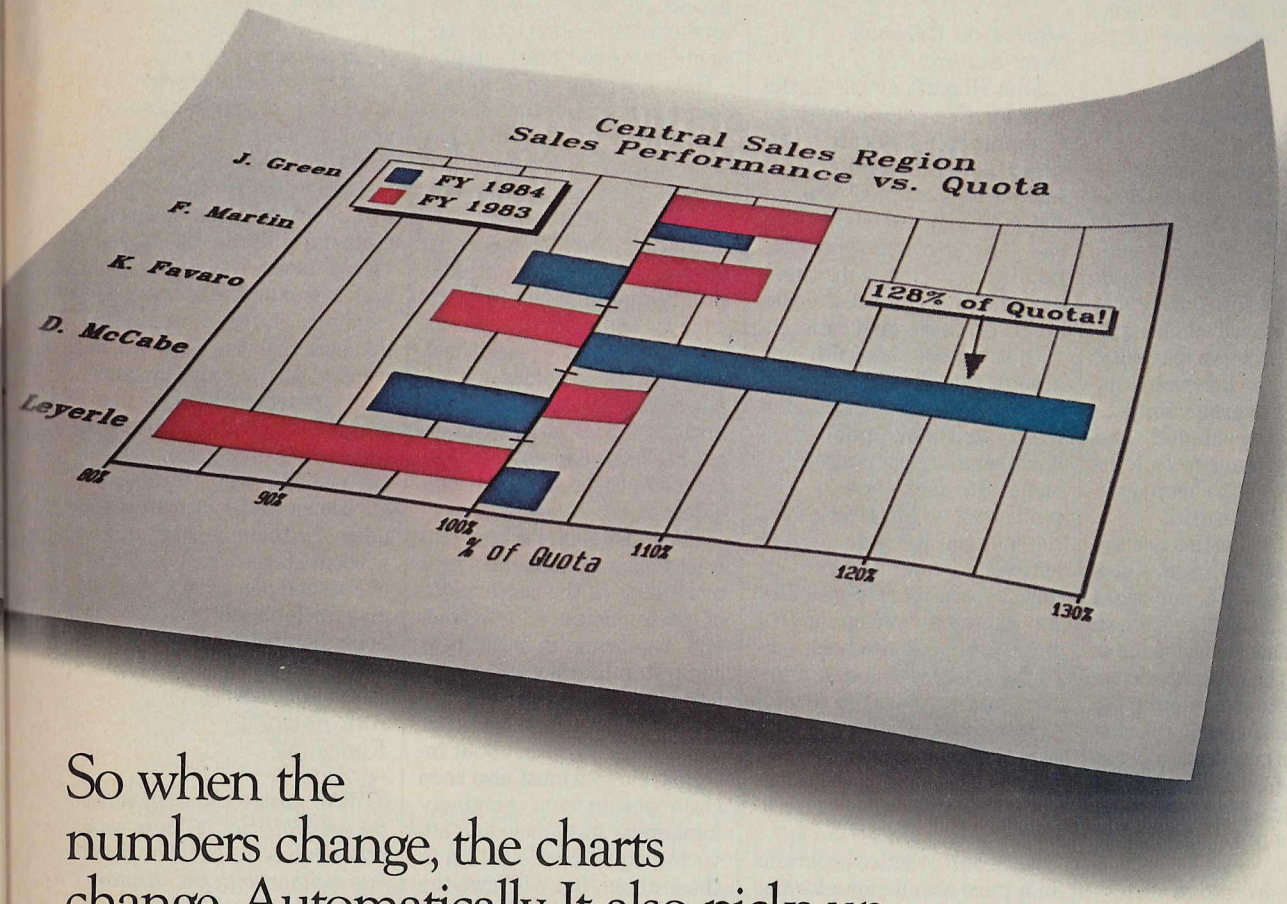

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LETTERS

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Contented Southpaw

Dear Editor:

I feel that John Edwards's Opinion in September's *Popular Computing* ("Feeling Left Out," page 26) is a bit one-sided. As a left-hander I take exception to his poorly researched remark about left-handedness being a disability. Check your information, John, about average abilities of southpaws, mental and physical. We *have to be* a little sharper just to keep up in a right-handed world.

Not all of us lefties are too uncoordinated to insert a disk into a drive with our right hand. The real problem we all face with the design issue is cost. Sure the computer company can retool and pump out left- or right-handed systems. But who do you think will pay for this? I for one don't want to pay more for a southpaw system when the one I use is fine.

Charles J. Korolden

Price Changed

Dear Editor:

I have just noticed that you mentioned RxSet in your August 1984 issue (page 48). Unfortunately the $15.25 price you quoted was an introductory price. The introductory offer lasted from the beginning of the year to June 1, 1984. The current price is $22, shipping included.

James B. Nickson
President, On-Disk Software

Heads Up

Dear Editor:

Regarding Lamont Wood's "The Heads-Up Display" in your October issue (page 51), how many heads does Lamont Wood have sitting on his shoulders? Only one, you say. If so, how about changing the title to "The Head-Up Display"? Thanks for an informative article.

W. Robert
Ridgecrest, CA

Micros on Campus

Dear Editor:

John Hogan's article in the *Popular Computing* Guide to Computers in Education, entitled "A Resourceful Look at Micros on Campus," was on the whole an excellent, concise look at college software publishing. However, there are several points that could stand further clarification.

Instructors should not assume that the only software (or the best) can be obtained from textbook publishers with separate software divisions. In fact, one of the publishers on Mr. Hogan's list disbanded its educational software group earlier this year, returning responsibility for software development to the traditional textbook editorial group. Indeed, a number of college textbook publishers have discovered that their software products must be developed and marketed in conjunction with the traditional textbook.

Drill and practice programs in a pure stand-alone format are giving way to interactive tutorials and simulations coupled with print materials that include objectives, problem-solving techniques, references to textbooks, examples, and exercises. The trend is toward making software easy to integrate into the standard curriculum.

Lloyd W. Black
Developmental Editor
Saunders College
Publishing, Div. of CBS
College Publishing

Marketable Skills

Dear Editor:

By concerning itself with current participation levels of girls in programming courses, Dan Watt's article "Bridging the Gender Gap" (September, page 54) misses several points.

First, change is occurring so rapidly in schools that much of the research may be studying dinosaurs. Schools are introducing the use of computers into coursework beyond mathematics at astounding rates. In a study we undertook that spanned two successive school years, the level of participation by all students increased substantially.

Second, programming courses may be the wrong measure of female participation. Given predictions of the number of programmers needed 10 years from now and other comments on the obsolescence of traditional programming skills, experience in applications such as word processing, spreadsheet analysis, and graphics may be more marketable skills for both boys and girls. Girls do not lag behind boys nearly as far when these skills are considered.

Third, we found school districts deemphasizing programming as the centerpiece of their computer offerings and replacing it with new computer literacy programs and application courses.

It is certainly the case that we must be vigilant about inequity. But we must also keep close tabs on what is actually happening in schools and advocate equal participation in those areas that will have the best future payoffs.

Jay Moskowitz
Bea Birman
Decision Resources Corp.
Washington, DC

Bon Appétit!

Dear Editor:

Thomas Woodruff's illustration accompanying "Home Computer Technology in the 21st Century" (September 1984) is racist and offensive. The rendering of a female "servant" robot that looks disturbingly like a black mammy wearing an apron and tossing a salad while an attractive woman with Caucasian features manipulates a computer keyboard eloquently depicts the real "progress" being made in the age of high technology.

The subtly derogatory message of this image ensures the entrenchment of primitive values in our technologically superior society.

Mary Guzzy
Administrative Director
Foundation for Independent Video and Film Inc.
New York, NY

Dear Editor:

We didn't believe what we saw in the September issue of your usually high-quality magazine. On page 76 an illustration by Thomas Woodruff shows what he and your editorial staff must think is a viable future—a robot that appears to be the stereotypical figure of a black woman in domestic service to a white woman! If you can't imagine a future better than our past and present, then that future isn't worth living for. When we visualize the future, we envision a world without prejudice, without exploitation, without stereotyping, a world of love and peace. It very well may include robots, but we hope that by that time we will have transcended bigotry.

Anna Koester
Ann Ratcliffe
Ripley, OK

We're sorry to have offended the sensibilities of these and other readers, but the fault lies neither with the illustrator nor in the editorial intent of the illustration. Woodruff's original portrayed an epicurean robot-chef, not a servant—if you'll look back you'll see a resemblance to Julia Child in the robot's facial features. To avoid the cliched C3PO gold or R2D2 silver, Woodruff cast his robot-chef in steely gunmetal. However, an overdose of black ink from our printer turned the original—and clearly nonracial—image into the unfortunate result readers have complained about.

Popular Computing welcomes your feedback regarding articles that appear in this magazine as well as your comments about the personal computing field in general. Write to Letters, *Popular Computing,* POB 397, Hancock, NH 03449. (Due to the number of letters received, we cannot respond individually.)

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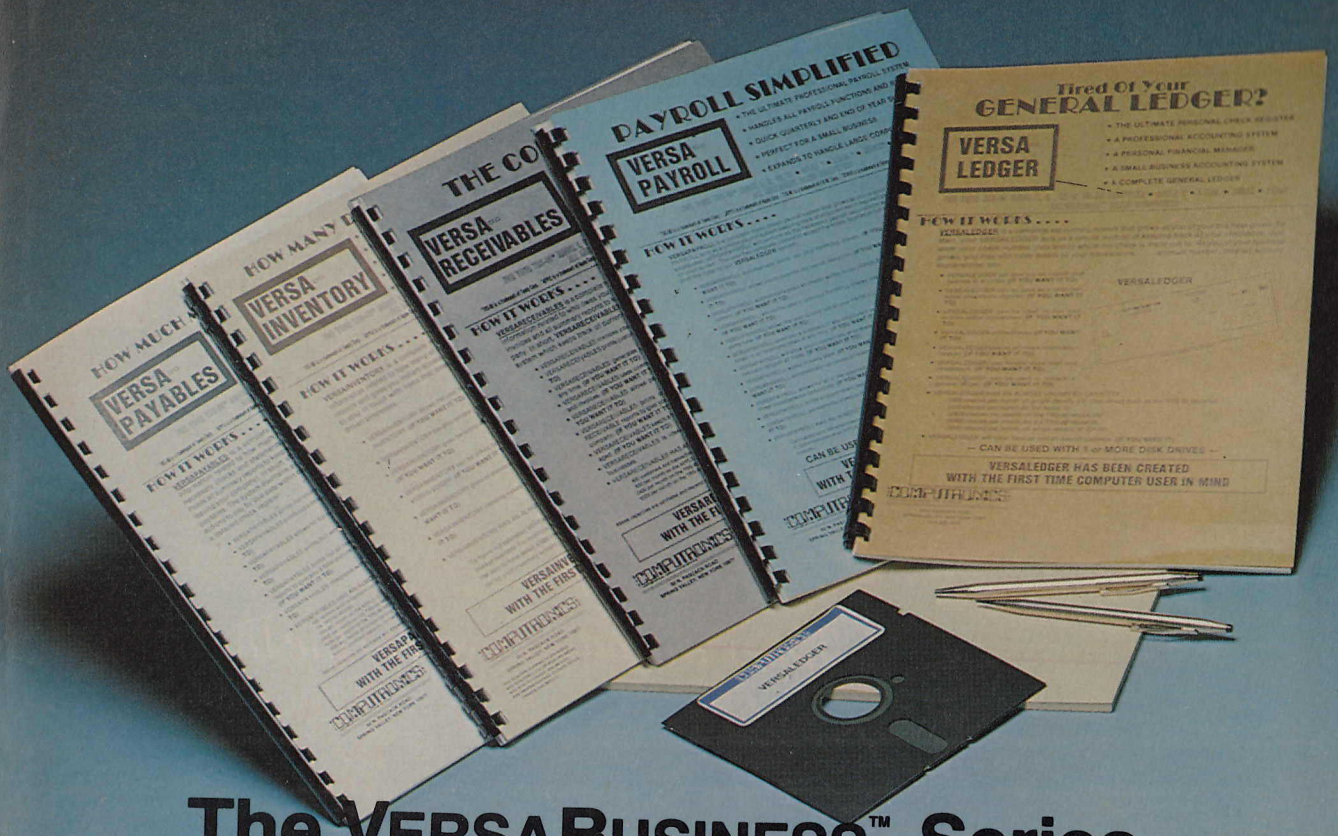

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IBM Elbows into the Software Market

Now that it has acquired a solid lead in the hardware end of the personal computer race, IBM is turning its attention toward the software market.

In the last few months, the Big Blue giant has made three major software announcements, each sending a shock wave through the ranks of the independent software producers:

- The company announced Topview, its multitasking, windowing environment. Other companies with windowing packages were far from overjoyed, though they're hiding their disappointment with platitudes about IBM "legitimizing" the market.
- While announcing two new optional enhanced graphics adapter boards to be plugged into the PC, IBM gave its support to a particular implementation of some graphics standards. The announcement pleases several software developers, but it makes life harder for those firms with products based on different versions of the standards.
- IBM announced a series of internally developed software programs, including integrated software and accounting, aimed at the business software market now dominated by firms such as Lotus, Micropro, Software Arts, and Peachtree.

Combined, these three moves signal IBM's intention to control a larger segment of the software market.

Let's take a closer look.

Software developers first saw Topview at an "anniversary" party IBM held in Dallas last summer—and it nearly killed the festive mood.

Topview provides an operating environment for the IBM PC family that lets you see several applications running concurrently in multiple windows, all controlled by a mouse pointing device. As such, it put IBM in direct competition with several software firms that also have announced windowing systems. Not only is the $149 Topview inexpensive, it has the IBM stamp of approval, and that may spell bad news for the other firms hoping to create a windowing environment.

Thus far, no windowing system has had a major impact on the software market. Visicorp's Visi On, Digital Research's Concurrent PC-DOS with Windows, Quarterdeck's Desq, and Structured Systems Group's Windowmaster have all failed to gain the approval expected of them.

In large part, these programs have languished because independent software vendors have not stocked them and because existing programs don't all work well with them. But Microsoft had higher hopes for gaining converts to its Windows system. Over the past year, except for IBM, nearly all the major manufacturers of 16-bit computers have said they will support Microsoft Windows in some fashion. But with IBM holding back, you have to wonder whether software vendors will come through with orders.

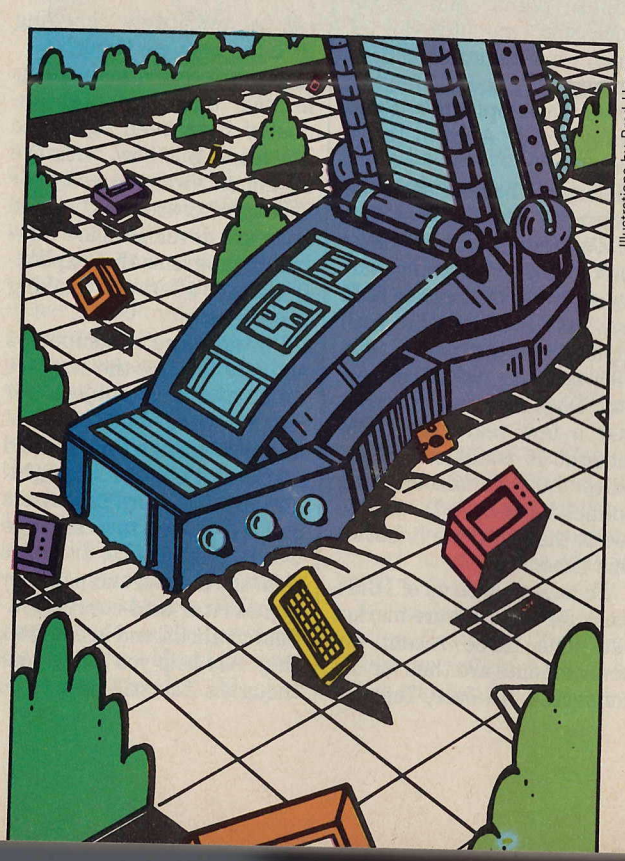
Topview, of course, has IBM's blessing, and software developers thus expect it will be successful. If they follow that expectation with programs designed for Topview, that itself should make the system successful. Already, the developers of both Desq and Windowmaster say they will make their systems compatible with Topview on the theory that as long as IBM has Topview, other hardware manufacturers will want compatible systems.

Privately, many software developers are skeptical of Topview, saying it simply isn't a first-class product. Also, it requires a lot of memory and a hard disk to work properly.

Developers apparently can create program interface files that let their programs run under Topview fairly easily. But writing programs that take full advantage of the system—including using the windows and data-transfer features—is a more complicated matter. So far, only a small number of programs will really work with Topview, such as IBM's Assistant series, adapted from Software Publishing's PFS series.

Software firms also fear Topview may be the first step toward an IBM proprietary operating system for the PC, one that would still run much of the MS-DOS software written for the machine. If so, it could signal the end of the open architecture that has encouraged so much independent software development.

IBM's second announcement should offer real benefits to end users, once the market has had time to react to the new products. The firm said it would be selling and supporting The Professional Graphics Series from Graphics Software Systems, Wilsonville, Oregon. This series, basically a tool kit that software developers can use to create graphics-based applications, supports the proposed Virtual Device Interface (VDI) standard under development by the American National Standards Institute.



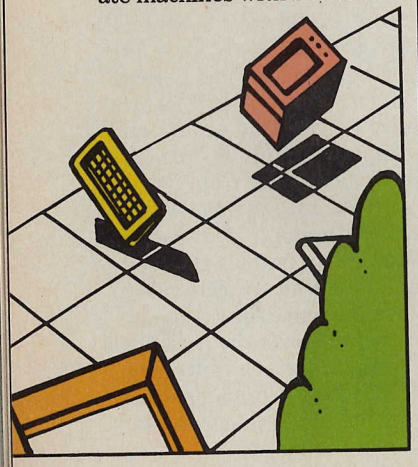
Illustrations by Brad Hamann

←On AIMS/inquiry card 46

The VDI tool kit gives developers "drivers" that take information from a graphics application and send it to a monitor or a peripheral such as a plotter or printer. The VDI drivers would come between the operating system and the hardware itself, so developers could use the tool kit to write graphics programs that work independently of the computer hardware. You wouldn't have to worry about whether a graphics program works with your hardware; the program would simply look for the VDI drivers.

For instance, a VDI-based program that displays graphics with a 640 by 200 dot resolution using a standard IBM color adapter and monitor would be able to display a 640 by 480 dot resolution on one of IBM's new optional higher-resolution graphics boards. The same procedure follows when adding a new printer or plotter. You wouldn't have to worry if all your programs worked with the new peripheral; you'd merely load a new VDI driver that would most likely be supplied by the hardware manufacturer.

In addition, a set of graphics standards would give hardware developers (IBM and others) more room to create machines with better and higher-resolution graphics.



The standards do raise a few questions, however. With its Windows product, Microsoft has been promoting a different—and apparently incompatible—implementation of the proposed VDI standard called the Graphics Device Interface (GDI). So we're left with at least two somewhat incompatible "standards." And, since either set of graphics drivers would come between an applications program and the hardware, it might slow down the program somewhat.

IBM's new applications programs may affect software firms most directly. The Business Management Series includes separate programs for general ledger, accounts payable, payroll, inventory accounting, accounts receivable, and invoicing. As such, it resembles similar series of programs from Peachtree, BPI Systems, and Dow Jones. The Personal Decision Series includes data filing, reports, graphs, plans, and word-processing modules—all of which work together and, in combination, seem aimed at Lotus Development's Symphony and Ashton-Tate's Framework.

Though I haven't seen the programs themselves yet, IBM's demonstration disks don't promise anything particularly new or exciting. IBM may have more trouble with applications software than with systems software, anyway. Does anyone remember that a few years ago, IBM thought it could sell Easywriter 1.0 to an unsuspecting public? We'll have to wait to see if they've done it better this time.

We haven't seen all of IBM's plans for the software market yet. The three recent announcements are thus far unconnected. To date, Topview does not support the VDI standard, and the applications programs don't appear to take full advantage of Topview.

Yet together they signal an intention to try to dominate the software market, a not wholly unexpected move. It's almost an IBM tradition to wait until smaller firms have staked out a market and then go in and take a large share.

In the software market, IBM must tread lightly to avoid scaring off the small firms completely. The IBM PC would not be nearly as successful without the thousands of applications programs developed by independent firms. If all these companies felt shut out of the IBM market and turned to, say, Apple's Macintosh, IBM could kill the goose that laid the golden egg.

In the personal computer hardware market, Apple and Tandy have grown and prospered since IBM entered the computer market. But many smaller firms haven't been as lucky, particularly those who chose to compete head-on with IBM. IBM's cost-cutting on the PC, sheer dominance in corporate sales, and expensive lawsuits against compatible manufacturers have caused more than a few firms to break out their supplies of red ink. Can we expect the same of IBM in the software world? You'd better believe it.

—Michael J. Miller

Is "Thought Processing" Just Another Buzzword?

Are computers changing the way we think?

In subtle forms, many firms in the microcomputer industry have been saying so for years. But now, with the advent of "idea processors" or "thought processors," some software developers are marketing programs that explicitly claim to affect our thinking processes.

I'm not sure if computers actually change the way we think—that's a subject for another time—but they certainly do change the outward manifestations of thought. For instance, word processors make it easier to rearrange words, paragraphs, or topics than the old pen-and-paper or typewriter-and-correction-fluid methods, and in doing so, they may help you refine your thoughts. You still have to do the thinking, though.

At face value, then, "idea processing" is just the latest in a long string of buzzwords the microcomputer industry is famous—or infamous—for creating. It's a term about as meaningful as "user-friendly." But the programs in these categories aren't as useless as their labels. Far from it. They just need to be judged on what they really do rather than on the buzzword used to market them.

Over the last few months, I've spent a lot of time using two radically different kinds of idea processors: outline processors and free-form databases.

Outline processors have been evolving for some time. For example, Living Videotext's Think Tank can trace its ancestry back more

than five years (ancient history, by computer standards) to a program-development system at the University of Wisconsin in Madison and to work done at Stanford and at several other software firms. In fact, Think Tank was the first of the major commercial outline processors, and it's the best I've seen thus far.

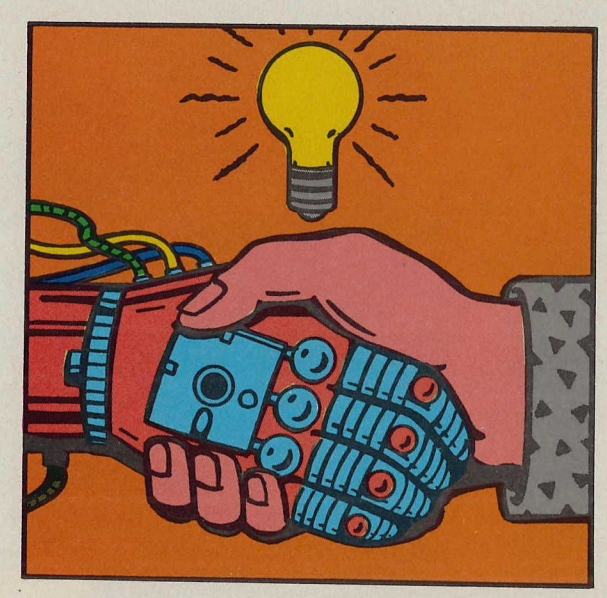
Available for Apple II, MS-DOS, and Macintosh computers, Think Tank lets you type in an outline and easily rearrange different sections of it. You can create an outline with some headings indented under others, then rearrange those headings almost effortlessly. Additionally, on the Apple and MS-DOS versions of the program, you can attach paragraphs to each heading and move the paragraphs as you move the headings.

The beauty of Think Tank—and what distinguishes it from a word processor—is that you can control whatever part of the outline you see at any point, using expand and collapse features to hide the paragraphs or the subheadings. (With a word processor, you see the full document, one line after another.)

The MS-DOS version of Think Tank makes it especially easy to type in ideas or notes and move them around to see where they fit best. That feature alone makes it easier to organize a set of ideas than a word processor does. I often use the program to write my rough drafts.

I also have used the Macintosh version, but in a different way. The current version, called Think Tank 128, lacks the ability to include paragraphs, so it won't work for writing rough drafts. But the mouse and the Macintosh user interface make it easy to do simple things I might otherwise do with pencil and paper, like keeping all of my to-do lists up to date.

In either version of Think Tank, if I'm creating a document other people will read, I always do my final editing on a word processor with sophisticated editing and formatting features. It's easy to transfer a Think Tank file to Wordstar, for example, but I would like to see a program that incorporates both word processing and outline processing. This isn't easy, though, because the two types of programs store information in different ways.



In the past few months, several other firms have either introduced new outline processors or incorporated outline processing into other applications programs. Two new programs offer more features than Think Tank, and though I haven't spent as much time with them, my first reaction is that they are more difficult to use.

Maxthink Inc., Piedmont, California, takes a different approach to outline processing. The firm's Maxthink program for the IBM PC and compatible machines limits you to viewing two levels of an outline at a time (Think Tank lets you see as many levels as will fit on your screen). But Maxthink adds new features that work well for organizing items in a list. The program lets you sort the items into various "bins," split them into different categories, or assign each item a priority.

Outline processing is even available to owners of 8-bit CP/M systems. Compusophic Systems, Aloha, Oregon, offers KAMAS (Knowledge And Mind Amplification System) for Kaypro, Morrow, Epson QX-10 and other 8-bit CP/M formats, one of the few new CP/M programs of the past year.

Several recent programs have attempted to marry outline processing and word processing in the same program, though at some loss of flexibility.

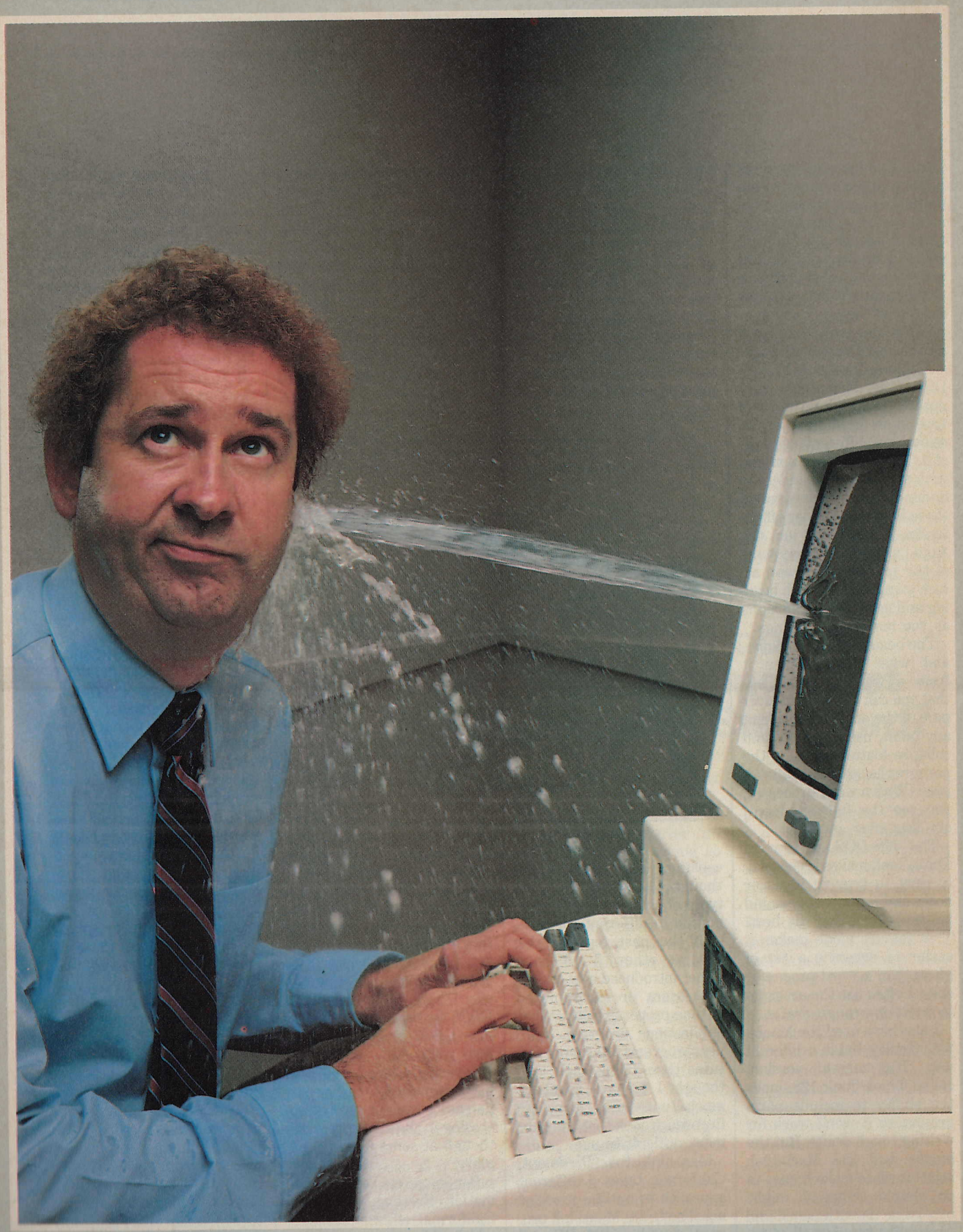
For instance, Select Information Systems, Kentfield, California, offers Freestyle, which adds outline processing to a version of its well-known word processor. The result is a workable, though not spectacular, union of the sets of features. But you have to switch between word-processing and outline-processing modes, and you can't move items in the outline nearly as easily as with Think Tank.

The same criticisms apply to the outline-processing sections of Framework. Ashton-Tate's highly publicized integrated software. An outline structure includes word processing, spreadsheet, database, and graphics applications as "frames" within an outline; you have to enter the appropriate frame to use the application. You can also use outlining features to rearrange the items in an outline just as you would with Think Tank or Freestyle.

Another type of program, a text or free-form database, often gets tagged with the idea-processing label. Traditional database-management products don't handle text very well because they require that all entries fit into predefined records and fields. Text databases such as Ideaware's Idea Processor, Dayflo for the IBM PC and compatible computers, and Forethought Corp.'s Factfinder for the Macintosh try to get around this requirement by letting you store ideas in small, easily retrieved text files.

Free-form databases help you sort and retrieve ideas and notes to yourself, but unlike traditional databases, they aren't designed to produce reports. Outline processors, on the other hand, help you restructure your ideas while they produce a written result. Perhaps in the future, we'll see the two functions combined effectively into a bona fide idea processor.

—Michael J. Miller



SOFTWARE SHOULDN'T MAKE YOU FEEL ALL WET.

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THE BUSINESS SOFTWARE THAT WORKS WITH YOU. NOT AGAINST YOU.

These days you have a flood of software to choose from. You might even know enough not to like some of what's out there.

Today, business software is extremely powerful stuff. Truth is, it can help you to be great...if you learn to use it. That's the unfortunate catch: powerful software is often powerfully tough to learn.

We don't think it should be that way and we don't think you do, either.

So guess what: it isn't anymore. Because now there's ABILITY.™

It's the new business software for people who want to get ahead. For the smart folks, who don't want a computer to be their only passion.

Yes, ABILITY is powerful, and yes, it's very sophisticated. Sophisticated enough to be easy.

ABILITY is easy to use, because it's so easy to understand. We took the time and the effort to make it that way.

To us, that's the whole point. Software shouldn't make you struggle.

ABILITY–spreadsheet, database, word processing, telecommunication, graphs,–and "Presentation!", an exclusive feature to present ideas with new impact.

You can learn ABILITY in less than a day. It will make your job easier, faster and even more fun.

Think about it. That's what "powerful" really is.

Turn the page, and see what we mean.

You've always had the ability to succeed.

Now you can have ABILITY.

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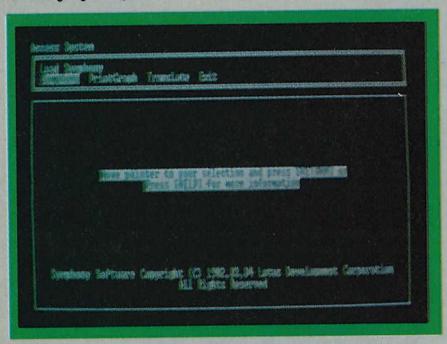
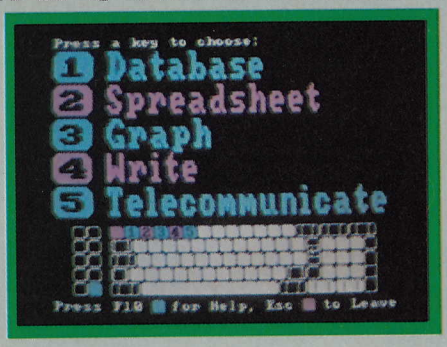
a·bil·i·ty *n.*

ABILITY is the power, mental or physical, to do something and usually implies doing it well.

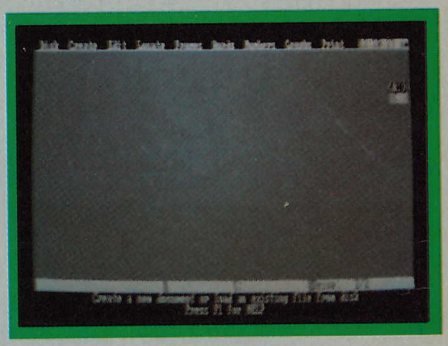
LOOK AT US. LOOK AT THEM.

From Symphony™





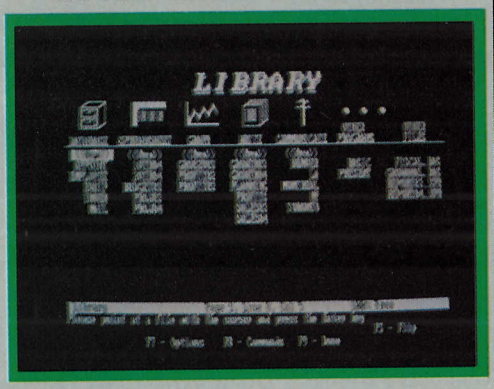
From Framework™



Right from the start, ABILITY is easier to use. Look at these first screens from Symphony™, Framework™ and ABILITY.

The entire ABILITY program is organized in a natural way, so it's easier to learn, easier to use.

THE LIBRARY...



...More than a library, it's a personal librarian.

This LIBRARY is unique to ABILITY. It's the place where all your work is organized for you.

With some business software, even adding a simple file is a hassle–and a deletion can require awkward commands and changes. Not with ABILITY.

You want to make a change? No problem. It's like having your own librarian handle all the red tape for you. Simple. Logical. ABILITY.

	ABILITY	SYMPHONY	FRAMEWORK
Data Base	Limited by Disk Size Only	Limited by RAM	Limited by RAM
Faster with 8087	Yes	No	Yes
Memory required to load full product	256K RAM	320K RAM	384K RAM
Can custom make a diskette presentation screen	Yes	No	No
Keystroke "flip" back to previous screen	Yes	No	No
"Free Form" spreadsheet	Yes	No	No
Suggested retail price	$495	$695	$695

Symphony™ is a trademark of Lotus Development Corp.

Framework™ is a trademark of Ashton-Tate

ability

ABILITY business software is a breakthrough in ease of use. You get the power to succeed–easily–with more functions, in less time, than virtually any comparable software.

ABILITY gives you power in a number of significant ways. Graphs and words, for example, can be used together to appear on the same screen. You don't have to go hunting them down from separate parts of the program.

ABILITY saves you time. Make a change in one number. If you wish, that change and its results are calculated automatically everywhere else that it matters.

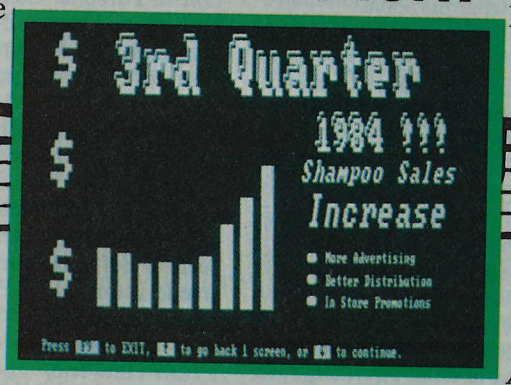
It even protects you from losing information by mistake. ABILITY double-checks with you first on major information changes. (Nice to know.)

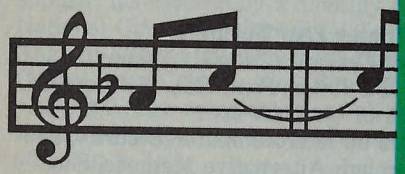
Help is just a keystroke away. ABILITY keeps it simple–so you're not deluged with "hints" that don't pertain to what you're doing.

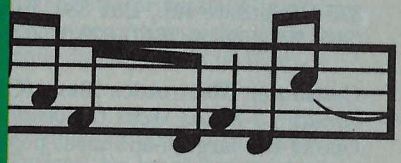
And don't worry about remembering codes and numbers of spreadsheet files. You can ask for what you want by its actual name (like "Sales" instead of C14).

Your ABILITY will grow as you grow. When you're ready to get more advanced, you'll find additional ways to be easier and faster. It's built right into ABILITY.

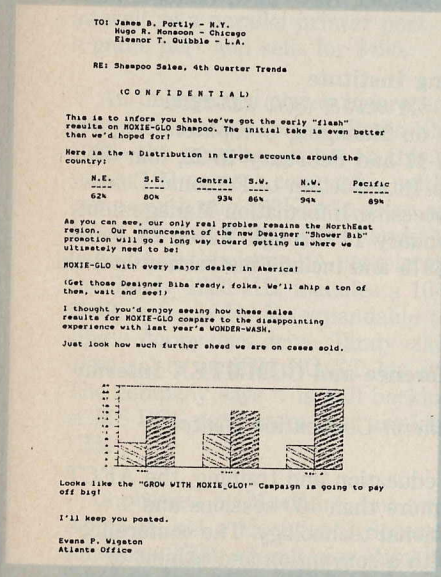
PRESENTATION!







WHAT YOU SEE IS WHAT YOU GET.



TO: James B. Portly - N.Y.
Hugo R. Monsoon - Chicago
Eleanor T. Quibble - L.A.

RE: Shampoo Sales, 4th Quarter Trends

(C O N F I D E N T I A L)

This is to inform you that we've got the early "flash" results on ROXIE-GLO Shampoo. The initial take is even better than we'd hoped for!

Here is the % Distribution in target accounts around the country:

N.E.	S.E.	Central	S.W.	N.W.	Pacific
62%	80%	93%	86%	94%	69%

As you can see, our only real problem remains the NorthEast region. Our announcement of the new Designer "Shower Bib" promotion will go a long way toward getting us where we ultimately need to be!

ROXIE-GLO with every major dealer in America!

(Get those Designer Bibs ready, folks. We'll ship a ton of them, wait and see!)

I thought you'd enjoy seeing how these sales results for ROXIE-GLO compare to the disappointing experience with last year's WONDER-WASH.

Just look how much further ahead we are on cases sold.

Looks like the "GROW WITH ROXIE_GLO!" Campaign is going to pay off big!

I'll keep you posted.

Evans P. Wigston
Atlanta Office

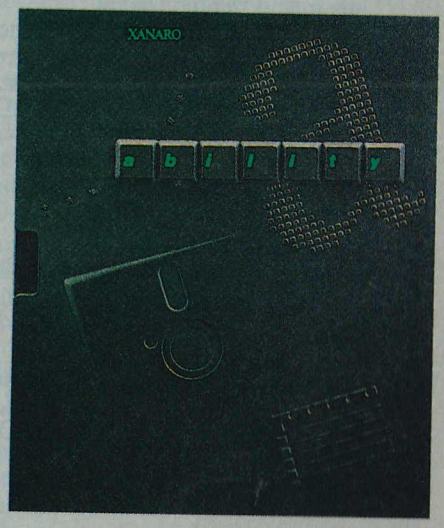
Print a complex, convincing letter using graphs and charts as you wish. Place whatever you want where you want it. What you see is what your printer prints.

This useful feature has never been included in a product like this before. It's a new presentation medium that's exclusive to ABILITY. It's like the basic ABILITY package, a snap to master and a joy to use.

PRESENTATION! lets you create your own slide-like presentation. Use a selection of graphic symbols, words, lettering styles and add them to graphs, text or spreadsheets. Plus, when you want, electronic musical punctuations. You can even control the timing of each screen.

Make vivid and powerful printouts. Or tell your business story on a disk. You can transmit complete presentations by telephone, to any ABILITY user, anywhere in the country.

For more information about ABILITY, the most significant business software available, see the expert at your computer products store. Try it out. We think you'll be very pleased.



NOW YOU HAVE THE ABILITY.

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On AIMS/inquiry card 80

Calendar

National Shows and Conferences

Communications Networks '85
January 28-31, Washington Convention Center, Washington, DC
For executives and managers in communications, information management, and marketing, this conference and one-day tutorials will present recent developments and address practical aspects of using and planning communications systems. More than 200 companies will exhibit products for voice and data communications, electronic mail, and networking with personal computers.
Cost: Exhibits only: $10; conference and exhibits: $195 for one day, $595 for four days. Registration Manager, 375 Cochituate Rd., Box 880, Framingham, MA 01701; (800) 225-4698 or (617) 879-0700 in MA.

Consumer Electronics Show (CES)
January 5-8, Las Vegas Convention Center, Las Vegas, NV
One of the largest and most popular shows, CES features electronic products for the home, including computer, telephone, audio, and video equipment.
Cost: $10 on site; no fee for advance registration. CES, Suite 300, 2001 Eye St. NW, Washington, DC 20006; (202) 457-8700.

Uniforum '85
January 21-25, Infomart, Dallas, TX
Sponsored by Unix user groups, Uniforum offers exhibits of software, hardware, peripherals, and services based on the Unix operating system, as well as introductory and advanced sessions on Unix, C programming, and related topics.
Cost: Exhibits only: $5 in advance, $10 on site; fees for tutorials and conference range from $50 to $175. Professional Exposition Management Co., Suite 205, 2400 East Devon Ave., Des Plaines, IL 60018; (800) 323-5155 or (312) 299-3131 in IL.

Regional Shows

PC World Exposition
January 16-18, Astro Hall, Houston, TX
Cost: Exhibits only: $15 for 3 days; conference and exhibits: $35 for 3 days. Mitch Hall Associates, POB 860, Westwood, MA 02090; (617) 329-7466.

Sauk Valley 4th Annual Computer Show
January 12-13, Northland Mall, Sterling, IL
Cost: Free. Write Sauk Valley Computer Club, Box 702, Sterling, IL 61081 or call Vinus Williams, (815) 225-7590.

Courses and Seminars

George Washington University
Continuing Engineering Education, School of Engineering and Applied Science, Washington, DC 20052; (800) 424-9773 or (202) 676-6106
Courses include Evaluating Microcomputer Software Packages, Comparative Database Management Systems, Workshops in Data Communications, Operating Systems, and Local-Area Computer Networks.

Institute for Advanced Technology and the Control Data Management Institute
6003 Executive Blvd., Rockville, MD 20852; (800) 638-6590 or (301) 468-8576 in MD
Primarily for business people, classes include Introduction to Personal Computers; How to Use Wordstar, Multiplan, Lotus 1-2-3, and dBASE II; Decision Support Systems on Personal Computers; and Computer Literacy for Managers and Business Professionals.

New England Computer Law Forum
Peter Marx, VP and General Counsel, Interactive Data Corporation, 486 Totten Pond Rd., Waltham, MA 02154; (617) 890-1234 or (617) 895-4081
Seminars for lawyers on Microcomputer Security, Protecting Software through Alternative Methods, Electronic Information Publishing Law and Regulation, and other topics.

Plum Hall Inc.
1 Spruce Ave., Cardiff, NJ 08232; (609) 827-3770
Beginning and advanced training seminars in C and Unix; classes held in Boston, New York, Raleigh, San Diego, and Dallas.

Wintergreen Learning Institute
POB 7, Wintergreen, VA 22958; (800) 325-2200
Four-day conferences on Managing Computer Resources, January 7-11 and February 18-22; four-day hands-on seminars on Introduction to Personal Computing and Word Processing/Information Management, continuously from January 14 through March 24; rates range from $570 to $975 and include instruction and ski resort lodging.

Special Interest

AECT Annual Conference and COMMTEX International Exposition
January 17-22, Anaheim Convention Center, Anaheim, CA
For professionals in education and training, the AECT conference includes more than 150 sessions and workshops on educational technology. The conference runs concurrently with a convention and exhibit of communications equipment held by the International Communications Industries Association.
Cost: Conference and exhibits: $85 to $135 with an additional charge for workshops. Association for Educational and Communications Technology, 1126 16th St. NW, Washington, DC 20036; (202) 466-4780.

Observations

Who's buying personal computers? Surprisingly—and despite what some computer advertising might lead you to believe—it's not the people who don't yet own computers. According to Software Access (a Mountain View, California, market research firm), the biggest buyers of new computers are people who already have one. The firm's study says that only 13 percent of those not currently using a computer plan to buy one in the next 12 months. In contrast, 37 percent of home users and 52 percent of work users expect to get an additional computer in that time period.

Computer crime may be the trendiest element of underworld behavior. And, like anything else that is popular, it's covered by a monthly newsletter. The National Center for Computer Crime Data in Los Angeles offers a monthly publication for $18 called *Conscience in Computing*. For $45, the center will sell you a 200-page compendium of all the state laws on computing called *Computer Crime Law Reporter*. Read all about it.

Plug-in board manufacturers have been quick to jump on IBM's PC AT bandwagon. AST was first to enter this market with its Advantage multifunction board, which uses 64K-bit or 256K-bit memory chips to add up to 3 megabytes of RAM. The minimally configured base-model board includes 128K bytes of RAM as well as a parallel printer port, two serial ports, and a game port and sells for $495.

An unexpected player has recently entered the IBM-compatible marketplace—Radio Shack. The Tandy 1000—the machine shown on this month's cover—is virtually 100 percent compatible with the IBM PC and comes with one 360K-byte drive and 128K bytes of RAM for just $1200. (The Tandy 1000 is reviewed on page 64 of this issue.) A completely different machine, the Tandy 1200 HD, includes a 10-megabyte hard disk, 256K bytes of RAM (expandable to 640K bytes), and a single floppy-disk drive. Tandy claims it is functionally identical to an IBM PC XT, but it costs only $2999. The company says it is still backing its Tandy 2000 line of MS-DOS computers that are less compatible with IBM.

Impressed by MacPaint, but own an IBM PC or an Apple II, not a Macintosh? Several companies have solutions. IBM offers Color Paint for the PCjr; Mouse Systems Inc. offers PC Paint, a color painting program for the PC, XT, PCjr, and compatibles either as a stand-alone product or bundled with its popular optical mouse; and Zsoft has PC Paintbrush, which is paired with Tecmar's Graphics Master plug-in board. For the Apple II, there are touch pads from Koala Technologies, Dazzle Draw from Broderbund Software, and Flying Colors from Computer Colorworks. These programs may not be quite as fast as MacPaint, but they all offer color.

The latest chapter in the rise and fall and rise again saga of Osborne Computer stars a 22-pound, $1298 transportable computer, the Vixen. It is smaller and faster than the original Osborne, features a 7-inch amber screen, packs 760K bytes of data onto two 5¼-inch disks, comes with a whole bundle of software—including a lightning-fast Wordstar 3.3, Mailmerge, and Supercalc 2—and a free membership in FOG, the First Osborne user's Group. Notably missing from the software bundle is a file management program. The Vixen will compete head to head with Kaypro for sales to students and professional writers; Osborne would rather compete in this niche than try for the mass market firmly in the hands of IBM, Apple, and Compaq.

Need a list of all the computer dealers in Topeka? Public golf courses in Tucson? Or landscape contractors in Denver? Tell your computer to call Instant Yellow Pages in Omaha, Nebraska. You can access on-line data for these and 300 other types of businesses; the initial set-up charge runs around $100, and subscription to the service costs $15 per month (billed annually) with usage charges billed monthly at $1 per minute of connect time. Names, addresses, and phone numbers in mailing-list format can be downloaded at 300 or 1200 baud. The service currently lists 6 million businesses and expects to offer every Yellow Page title in the country by the end of 1985. How? Thanks to the efforts of 75 people working full-time entering the data.

You may be seeing more full-screen projections of software at computer shows and stores in the coming months. Vivid Systems Inc., Palo Alto, California, has introduced the Limelight computer projector, a $3950 22-pound projector that plugs into a personal computer and displays a 4- to 10-foot image on a wall.

What's the latest skill you can learn from a computer? Breakdancing, of course. Break Street, a new $24.95 program from Creative Software, Sunnyvale, California, for the Commodore 64, promises to teach you how to out-Michael Jackson the man himself.

With its proposal to acquire Rolm, a Santa Clara, California, telecommunications company, IBM seems to be broadening its sights. IBM had earlier acquired a 23 percent stake in the manufacturer of computerized switchboards and similar products; this recent move is seen as part of a strategy to compete head-on with AT&T.

What's Wrong with Word Processors

I'm a full-time freelance writer specializing in computers, so I've had lots of opportunities to look at word-processing programs. It's led me to the distressing conclusion that 99 percent of word-processing programs are completely unsuited for 95 percent of the people using them.

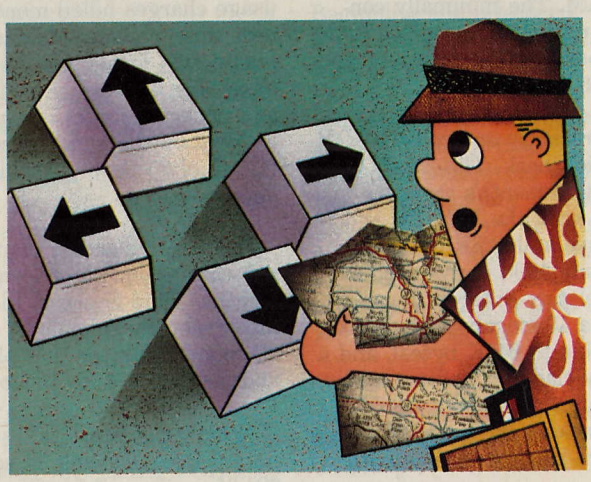
At a recent Comdex, for example, I made a point of trying all the word-processing software I could find, including some of the most highly touted and acclaimed products. I ran the same test on each program and found that I could immediately eliminate three-quarters of them from serious consideration.

Did I test their footnote capabilities? Or try an elaborate series of formatting commands? No. These word processors failed on the elementary features that are basic to the process of writing on a computer. All I did was type in two simple paragraphs, correct my mistakes, and move the second paragraph in front of the first.

This sorry state of affairs exists because the designers of word-processing software have never really bothered to study the process of writing. They don't seem to understand what is important to the people who will be using the programs. For example, most people compose text by writing and rewriting at the same time. We put down a couple of sentences, change something, maybe back up a paragraph or so to change something else, swap a couple of sentences, and then go on. To do this, all you need is maybe a dozen basic word-processing commands—the other features are used much less frequently.

Unfortunately, most word processors don't distinguish between the handful of critical commands and the much larger battery of occasionally useful maneuvers. The software responds to all commands at the same speed, often making you wait for three or four seconds while it executes one routine function. Does this sound trivial? So is a pebble in your shoe on a long hike.

A related problem with many programs is that they fail to distinguish between *typing* and *writing*. Typing a business form letter is a much less interactive process than writing an essay, for example. A typist is not likely to be concerned if the program requires leaving the create text mode and entering the edit mode to make most corrections. But someone who is writing—creating new text from scratch—could go nuts having to shift modes three or four times in a paragraph just to clarify thoughts and correct mistakes.



More trouble crops up when a word processor mimics one of the dedicated text-entry systems. It doesn't matter what system is copied; the result is seldom good.

It's not that dedicated text-entry systems are bad—they're very useful tools in the right environment. But if you examine that environment, you'll see it bears little or no resemblance to writing on a microcomputer.

First, there's the matter of training. A text-entry system operator usually gets anywhere from three days to a couple of weeks instruction on the equipment. With a well-trained operator at the keyboard, a dedicated text system can get away with an extremely complex command structure. And on some of those machines the commands are downright arcane.

To complicate matters further, these machines often have complex keyboard layouts. Recently I saw a keyboard for a dedicated text editor at the local electronics store, and I counted 120 keys on it before my eyes glazed over. When you try to impose that kind of complexity onto a standard microcomputer keyboard, you're in trouble.

Another semi-wrong-headed group of word processors is modeled after text editors for mainframe or mini computers. Typically such programs are strong in line-manipulation commands and weak in sentence commands. But the sentence is the basic unit of English. Deleting text one sentence at a time is much more convenient than doing it a line at a time.

A line-editing program betrays its origins in other unpleasant ways. Take cursor controls, for instance. You can move the cursor forward or backward by character, word, sentence, line, paragraph, page, and document. That's 14 commands just to move the cursor around.

One of the reasons for this multiple-command structure is that cursors moved slowly on many of the terminals these text editors were designed for. (The terminals were tied by a fairly slow serial line to a computer shared by other users.) When the screen updates are slow, it makes sense to have all those commands, but that is almost never the case with a microcomputer.

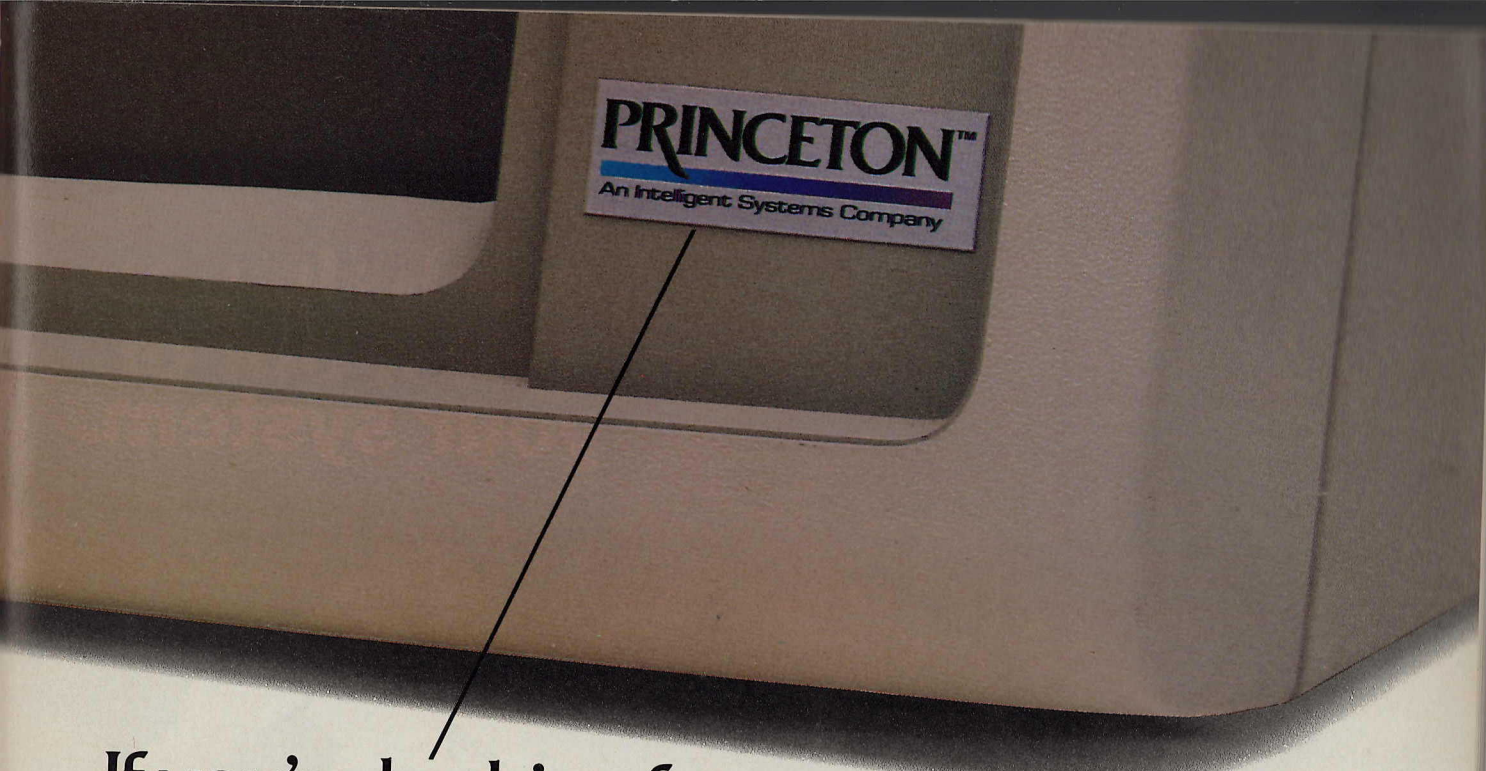
The *right* way to design a word processor is to do it with the average user and microcomputer in mind. Oddly, the less expensive programs seem to reflect this approach more than the high-priced ones.

Although a professional writer isn't the same as an average user, many professionals have chosen less expensive programs. After extensive comparisons, I settled on a $49.95 program called Wordvision. It is somewhat limited and has some awkward features, but it does most of what I need done in the way I need it done and does it better than programs costing 10 times as much.

My advice: don't confuse a word processor that has a laundry list of features and a big advertising budget with one that really suits the way you write. —Rick Cook

Rick Cook is a freelance writer based in Phoenix, Arizona.

Illustration by Bob Scott



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Black Market Macs

The flip side of Apple's campus marketing scheme

by Steven Levy

Ninety-nine days after the official January 24, 1984, introduction of Apple Computer's amazing Macintosh, I was among several journalists having lunch with Apple's John Sculley. The president of Apple is a modest, soft-spoken man who has become very good at presentations like this. It occurred in the front room of his suite at the Helmsley Palace on Madison Avenue in New York City, and we sat on the tasteful and proper French provincial furniture as Sculley went through a brief spiel about Apple's market plan, making helpful diagrams on a huge tablet supported by an easel. After he pocketed his magic marker, we sat to talk.

I pointed out that when Macintosh was introduced, everyone at Apple had been obsessed with getting the message of that machine across in the "First Hundred Days." Well, that make-or-break first hundred days was almost up. Was he perfectly confident that the Macintosh had made it? "Yes," he said unhesitatingly. And we chatted for a bit about this or that aspect of Macintosh-iana, with Sculley taking each query and fully addressing it.

Then I asked him the one question he would not answer. "What about those low prices the college students are paying for Macintoshes?" I wanted to know. "Is there really a Macintosh black market created by students who buy at those low prices and then sell to people who would have otherwise bought them from dealers?"

I was referring, of course, to Apple's plan to sell Macintoshes—eventually over 100,000 of them—to students, faculty, and staff members of selected colleges. The prices would be cut to the bone—while Macs then retailed for $2500, and the accompanying Imagewriter printers went for $600, those buying from the college plan would get Macs for $1000 to $1300, printers for well under $400.

I had read about some Apple dealers who were furious at what they considered unfair competition. And on the face of it, they seemed to have a point: Apple's plan to spread its product into the academic community at bargain-basement prices—tens of thousands of computers at discounts of over 50 percent of the list price—seemed a threatening prospect.

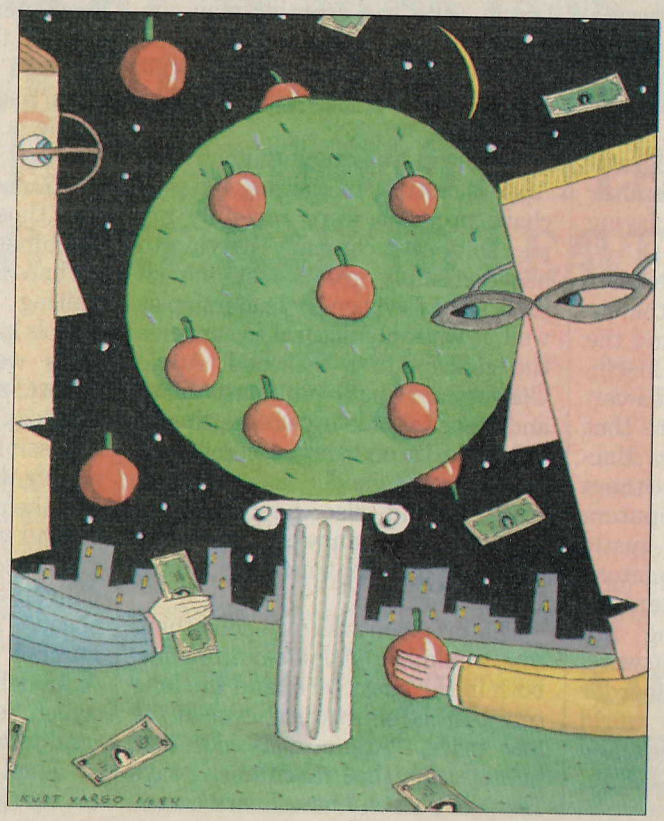

Illustration by Kurt Vargo

Some observers were predicting that the well-publicized program would hurt Macintosh sales overall—who was going to pay $2500 for a computer when college students could stroll into a campus store and plunk down $1100 or so for the same machine?

There was talk of black-marketeering, an underground railroad of sorts, pipelining Macs out of college towns and into the cities. No wonder

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Sculley said he didn't want to talk about that just then. It was apparent that he was uncomfortable with the situation. Obviously, Apple was still making its plans to deal with the problem.

That conversation occurred several months ago, and now it is the first full school year in which Macintoshes are available to colleges. Apple's battle plans are in place. It seems a good time to follow up on the issue. Especially since among the circles I frequent, there is much talk about finding someone in an Apple-approved college who has no use for a Macintosh and having that student, faculty member, or staffer buy a Macintosh and "flip" it (some schools use that as a terminology). A buyer can flip his or her Macintosh either as a favor to a friend or for a couple of hundred bucks of profit.

A Flippin' Good Deal

I was present at one such flipping. The privileged student, staffer, or professor in question (never mind who, never mind what school) in this case had no profit motive. It was a favor for a friend. The flipper—whom I shall call Mr. Macintosh in honor of a software "gremlin" secretly implanted in the Mac's ROM by Apple's playful programmers—had no need for a computer and saw nothing wrong with playing the role of surrogate buyer.

Mr. Macintosh and the eventual recipient of the Mac met at the on-campus distribution point, and the real buyer watched while Mr. Macintosh made the purchase with a certified check; the week before that sum had been paid to Mr. Macinstosh by the purchaser. Others were picking up their computers around that time, and in the bustle no one questioned Mr. Macintosh about the machine's eventual destination. Then, carrying Imagewriter, computer, and software, they ambled off, crossing the border between campus and real world without so much as a quickened heartbeat. Not exactly the stuff of smuggling dramas.

Seemingly, this was a flawless exchange (though as we shall see, Apple has a system that may expose the scam yet). The fact that exchanges like this might be occurring on a widespread basis—or, much worse, a ring of such exchanges occurring in fraternity houses or dormitories—is the kind of thing that probably is the stuff of Apple's nightmares.

The Flipping Question

But is flipping, at least on a small scale, *really* so bad? There is more involved in this than a bargain hunt. As I looked deeper into the situation, I found it brought up questions of corporate responsibility, the relationship between academia and commerce, and even the morality of the individual. The Flipping Question raises issues that seem to matter much more than saving a few hundred bucks on a computer.

On one hand, we have Apple Computer. I called the guy in charge of the Apple-to-University interface, an amiable young man named Dan'l Lewin (like the frontiersman, he prefers a rustic apostrophe in his first name). He was more than willing to grapple with the Flipping Question.

As Lewin was quick to point out, Apple's motives in starting the purchase program were certainly impeccable. As a company striving to be "incredibly great," not only in profits but in visionary leadership as well, it was only natural to conceive the concept of a 24-school Apple Consortium that would use Macs and Lisas to come up with righteous solutions to on-campus computing problems and good ideas in general. Apple would also beef up that limited consortium with a university purchase plan that includes almost 100 schools.

The program was also something that would help Apple's bottom line, both in the short term and the long term. In the short term, even at the low price, "Apple does not lose money on the machines," says Lewin. It costs, I have heard, somewhat over $500 to produce a Mac, and when you figure that the dealer markup is nonexistent on the program (the buyer pays a relatively small "handling charge"), Apple is probably coming out fine. Also, says Lewin, "we've found that in the first year after a person buys a CPU [a computer], he or she will buy $800 in peripherals—and we have a higher profit margin on those than we do for CPUs."

In addition, Apple has to be happy at the prospect of college students—even friends of college students—getting their hands on Macintoshes, especially in these early days of the machine when the promise is more apparent than the utility. Add to that the oft-repeated contention that if you expose kids to a certain brand of computer, they will naturally want to continue using that computer when they get out of school. So altruism aside, the college program is brilliant for Apple. (And Apple is not alone in penetrating colleges—both DEC and IBM are big on-campus presences.)

So why even bother to worry about what kids, or their teachers, do with the Macs? Retailers. Apple depends on retailers to display, advertise, and sell its products. So Apple is careful not to offend those dealers. It has to give the dealers assurance that the first priority is not those bargain-priced college machines, but the regular outlets.

That is why there were long waiting lists for Macintoshes at schools last spring. Newly announced Macs were in short supply, and almost all of them went to the retailers. "When all the press [about a possible black market] was happening it was February and March. But the reality was that even by the second week in April—there was a grand total of 48 Macs actually delivered to the schools for purchase." Lewin clarified that that number didn't count the 1000 or so Macs delivered to Drexel University, which requires all incoming freshmen to buy the machines; Macs are so deeply integrated into the Drexel curriculum that "it would be

Steven Levy is a contributing editor of *Popular Computing.*

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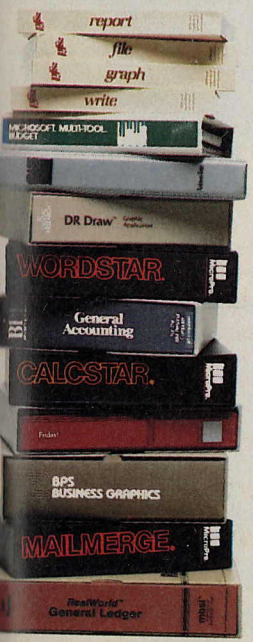

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academic suicide not to have one," says Lewin.

Now the schools are getting them in volume. And the numbers are impressive. The University of Texas, for instance, guesses that in the next year it will move between 10,000 and 15,000 Macintoshes at around $1100 each.

Getting Branded

So what is Apple doing to prevent flipping? Plenty, says Lewin. "Each school has to present us with a business plan which shows an agreement that the individual must sign," says Lewin. The agreement, he says, limits purchase to full-time students, faculty members, or staffers. The computer is to be used only for "personal and educational use." And there must be sanctions to enforce that agreement.

I talked to some people administering purchase plans at the schools, and they bore out Lewin's claims, sometimes bolstering them with extra twists. At the University of Michigan, for instance, each student signs an affidavit, according to provost Greg Marks, and agrees not to sell the machine for two years. In addition, each Mac sold at the University of Michigan is branded, much in the same way that ranchers brand cattle. A soldering iron and a copper "U of M" seal—"crafted by a local artisan," says Marks—is used to burn the 1½-inch square brand on the rear of the computer, 1/8 inch into the surface, to permanently identify it as a machine bought at student prices. Marks says that he also instructs people at the purchase center to watch for students who don't seem interested in buying a Mac but are accompanied by someone who is. In those obvious cases, where the flip is "badly done," says Marks, "we have stopped the deal." The university also has established a penalty for those caught flipping—a $2000 fine.

You think that's harsh? "In some cases," says Apple's Dan'l Lewin, violating the agreement is "grounds for dismissal or expulsion."

That's right. I spoke to Douglas Van Houweling, the vice provost of computing and planning at Carnegie-Mellon, who told me that violating the don't-sell-it-for-two-years agreement means grounds for student disciplinary proceedings. "It's rather clear that it means a student would be suspended, perhaps expelled," he says. For faculty members and staffers, violating the agreement is "grounds for prosecution or possible termination."

Apple seems very serious about this. And according to Lewin, the safeguards do not stop with the university. "We have other ways to monitor things that I don't want to see in print," he says. I got a clue of what those mysterious ways are from Carnegie-Mellon's Doug Van Houweling. Actually, they're kind of obvious. "We have a list of serial numbers that we report to the manufacturer," he says. The idea is that when someone takes an Apple in for service, that number will be sent to Cupertino and checked to make sure the student or faculty buyer is still with the machine.

This is *hardball*. Getting fired from a job or kicked out of school is something that may well be ruinous to someone's life—a blot on a record as permanent as a burned-in insignia on the back of a Macintosh. Even a school that enforces the buyer's agreement as strictly as the University of Michigan balks at giving that ultimate academic sanction. "It really is at odds with our academic philosophy to say we're going to expel you for that," says Michigan provost Greg Marks. All this brings up the question of who is being served when universities invoke this harsh sanction. The student? The educational process? Or Apple's marketing plan?

All-American Activities

Just what exactly is the crime here? Let me go back to Mr. Macintosh. He is not a member of the University of Michigan community, so the computer he bought was not branded. And though Dan'l Lewin might well be correct in saying every school requires purchasers to sign a no-resale-for-two-years agreement, I questioned *this* particular qualified buyer after the sale, and he professed to know nothing about this requirement. Racking his brains, he did remember signing a paper but was sure it was just some form of financial receipt. No one told him that he couldn't resell, and he guesses if the institution had made a big deal of it, he wouldn't have done the friend the favor. The reason he did it in the first place was rather plain—the opportunity was presented to him, and nothing about it *seemed* wrong.

No wonder. The fact is that bargain-hunting is an all-American activity. People like to boast about what a great price they got for this and that. Don't you feel like an idiot when you buy something for $100 and later talk to someone who paid only $70?

Buying a flipped computer is not the same as buying an apparently stolen piece of machinery from someone selling from the back of a truck. It's not like you're stealing from the needy. For one thing, the schools on the Apple purchase plans are definitely not chosen by the degree of financial need of their student body. Among the schools are fat-cat institutions like Yale, Princeton, Stanford, and Brown. Anyway, Apple has put no limit on how many the schools can order, as long as the buyers are qualified (and only one machine to a buyer). And it's not like you're stealing from Apple—by its own admission, Apple isn't losing money on the deal and in fact is making a bundle on the peripherals. (The recipient of Mr. Macintosh's machine, not incidentally, bought a $500 disk drive not long after the deal and plans to buy an Apple modem next.)

The only people who seem to have a real gripe are the dealers who might otherwise have sold Macintoshes to those buying on the college plan. But I recently called a guy who seemingly should be outraged by the situation—one Mark Gross, manager of two Computerlands in Austin, Texas, where over 60,000 students,

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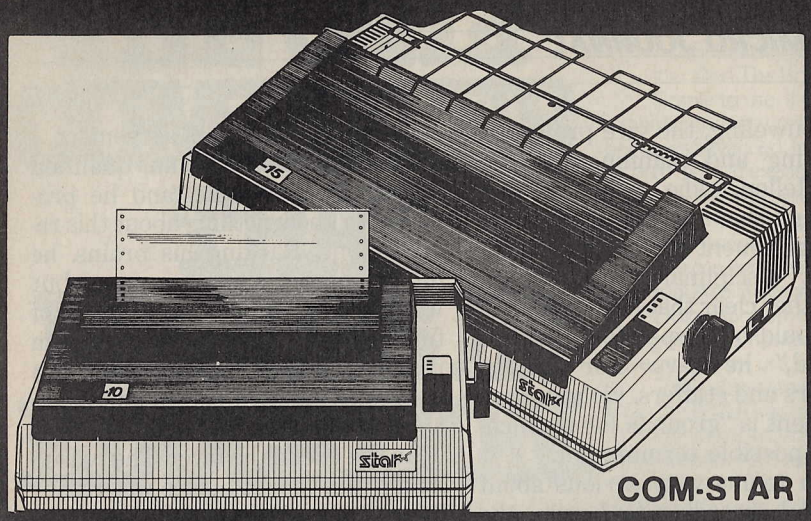

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staffers, and professors at the University of Texas have a shot at buying Macs at prices far below what he can offer. And what did he say? "I haven't spent a lot of time thinking about it," he told me. His lack of outrage might be explained by a phenomenon described to me by Blake Justice, manager of the micro center at the University of Texas. "There's a lot of spin-off business for dealers—software, for one thing. Also, we find that when the kids go home for vacation, the parents play with the machines and become addicted. Now the parents want one, and if they do, they have to buy from a dealer."

Flipping *is* troublesome in that it upsets Apple's marketing plans. And I'm sure some dealers are more upset about the college purchase plan than Austin's Mark Gross. Still, it is not clear that a company has the ultimate right to dictate where its products will go. There is strong disagreement, for instance, on the ethics of the "gray market" in items like cameras, where a company will sell its products at one price to dealers in one country and a much lower price to those in another. Then it will raise up a stink when dealers in the first country buy in bulk from wholesalers in the second, thus offering lower prices to the consumer. The companies sometimes are in the awkward position of explaining why consumers should pay a higher price for the "authorized" product—the same as the imported, "unauthorized" product.

Practical and Moral Issues

What arguments can Apple legitimately offer consumers to prevent flipping? One is obvious—it's a huge hassle. First you have to know someone who is qualified and doesn't want a computer. (Often the student will quite wisely keep his or her option open to buy at a later date—"our biggest guarantee against abuse of the agreement is that you can buy only one," notes Texas's Blake Justice.) Then you have to go through paper signing and a transfer of funds for a computer that, according to warranty, really isn't yours. If the computer breaks down, you're in big trouble.

Finally, as Apple keeps lowering the price of the Macintosh, the deal that college people get isn't as amazing as it was originally. When there was a Mac shortage, and one had to pay the list $2500 for a computer, a college price like Michigan's $1343 sounded unbelievable. But now that Mac's list (as of September) is down to $2195, and retailers are discounting, I've seen new Macintoshes offered for as little as $1649. Not nearly as tempting a difference.

Still, listen to what Dan'l Lewin said when I asked him what Apple could say to a hypothetical, computer-loathing student at Yale whose computer-loving brother wants him to buy a Macintosh so he can flip it to the brother. What reason could he give to stop that exchange?

"We think there's a moral issue involved," replied Apple's Dan'l Lewin. "The person who later sells the computer is committing fraud when he signs a statement saying he won't. We have to believe in people, or the world won't win."

I can understand the reasoning behind that statement, and I can applaud Apple for its innovative and worthy program. But I find it somewhat disturbing that Apple takes such a hard line. Lawyers ought to address the issues of fraud and breach of contract—certainly I do not advocate either activity. But I think that the invocation of morals is a bit self-serving here. These are, after all, college kids with a chance to either make a hundred bucks or so, or do a favor for a friend—with no apparent victim.

Remember the Blue Box

I seem to recall a well-publicized story of a couple of college kids not long ago who in their enthusiasm for technology (and desire to make a buck) did something far more insidious than flipping Macintoshes. They built a "blue box"—a machine that enables one to make free long-distance phone calls and literally steal from the telephone company.

First they sold those boxes door-to-door in their Berkeley dorm; eventually they sold them to some people who were reportedly arrested for using them.

Those two kids never got busted for their labors but knew they were doing something outside the law—once when a cop stopped them, they lied about what the blue box was, calling it a Moog synthesizer. Yet over a decade later, the students having achieved some respectability, neither has seen fit—as far as I can see—to confess that those activities were at all immoral. They were just college pranks, the better to show their laudable iconoclasm and cheek. Do you believe for a second that either of those two kids would have scorned a fellow student at Berkeley for the immorality of flipping a Macintosh? That they would have thought it fair for a kid to be expelled, or a teacher fired, just for taking advantage of an opportunity?

Those two former students are, of course, Steven P. Jobs and Stephen Wozniak, the founders of Apple Computer. Lighten up, guys—the college plan is working. The frat houses have not turned into outlaw computer stores, and the college papers are not loaded with classified ads pushing cut-rate "slightly used" Macintoshes. Instead, students and teachers who want Macs are buying them, and using them not only to improve their academic pursuits but also to write software, some of which is rumored to be incredibly great.

And true, a minority that doesn't want machines is flipping them—but the people who are receiving those computers are people desperate enough for Macs that they are willing to endure hassles to get them for a couple of hundred dollars less than usual, money that maybe they could not afford to part with. Some of those people may well be Apple's biggest fans.

I applaud Apple for its work in spreading computing to the college community and hope the best for its program. I just keep wondering what Woz and Jobs would have done back then. □

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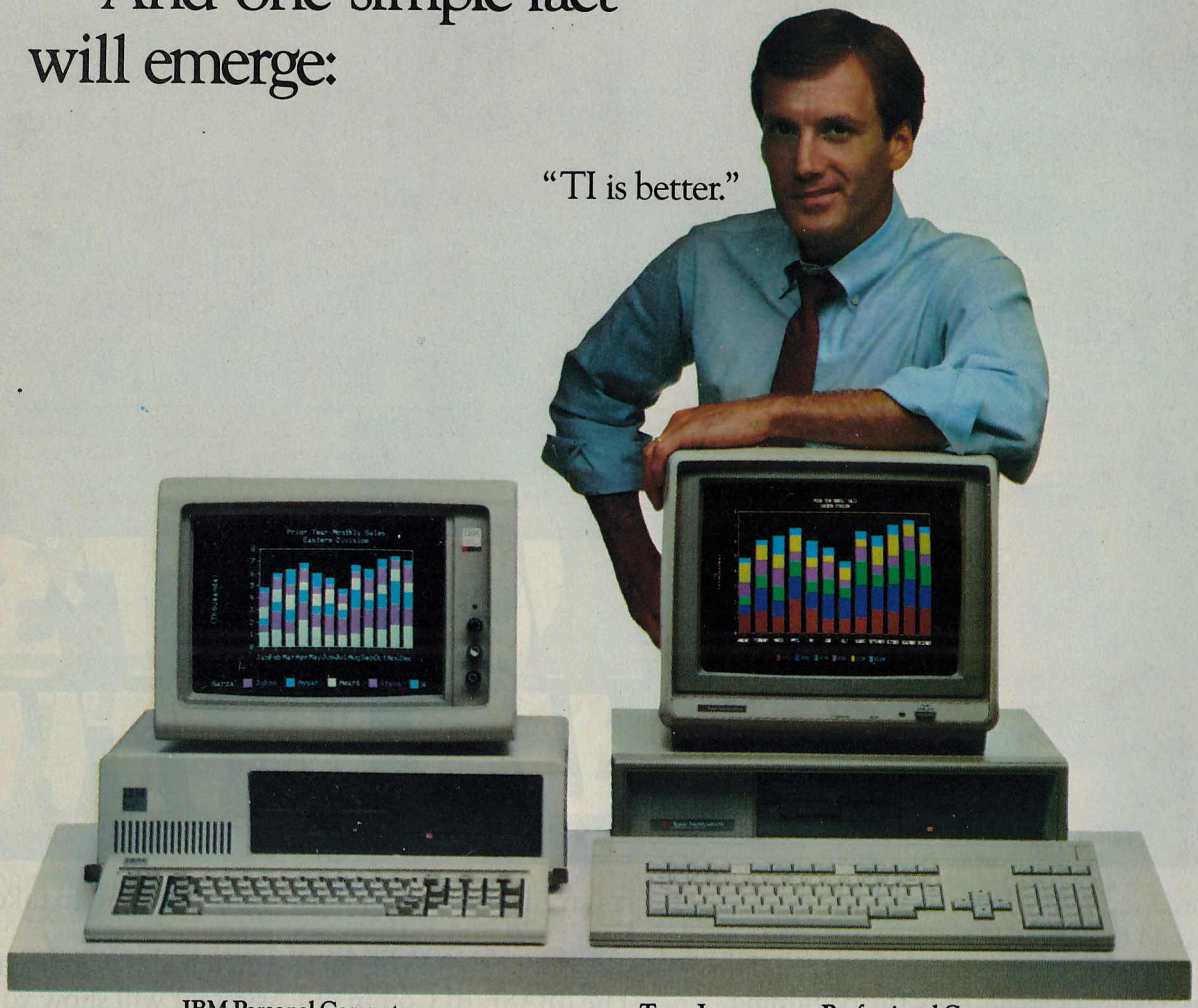

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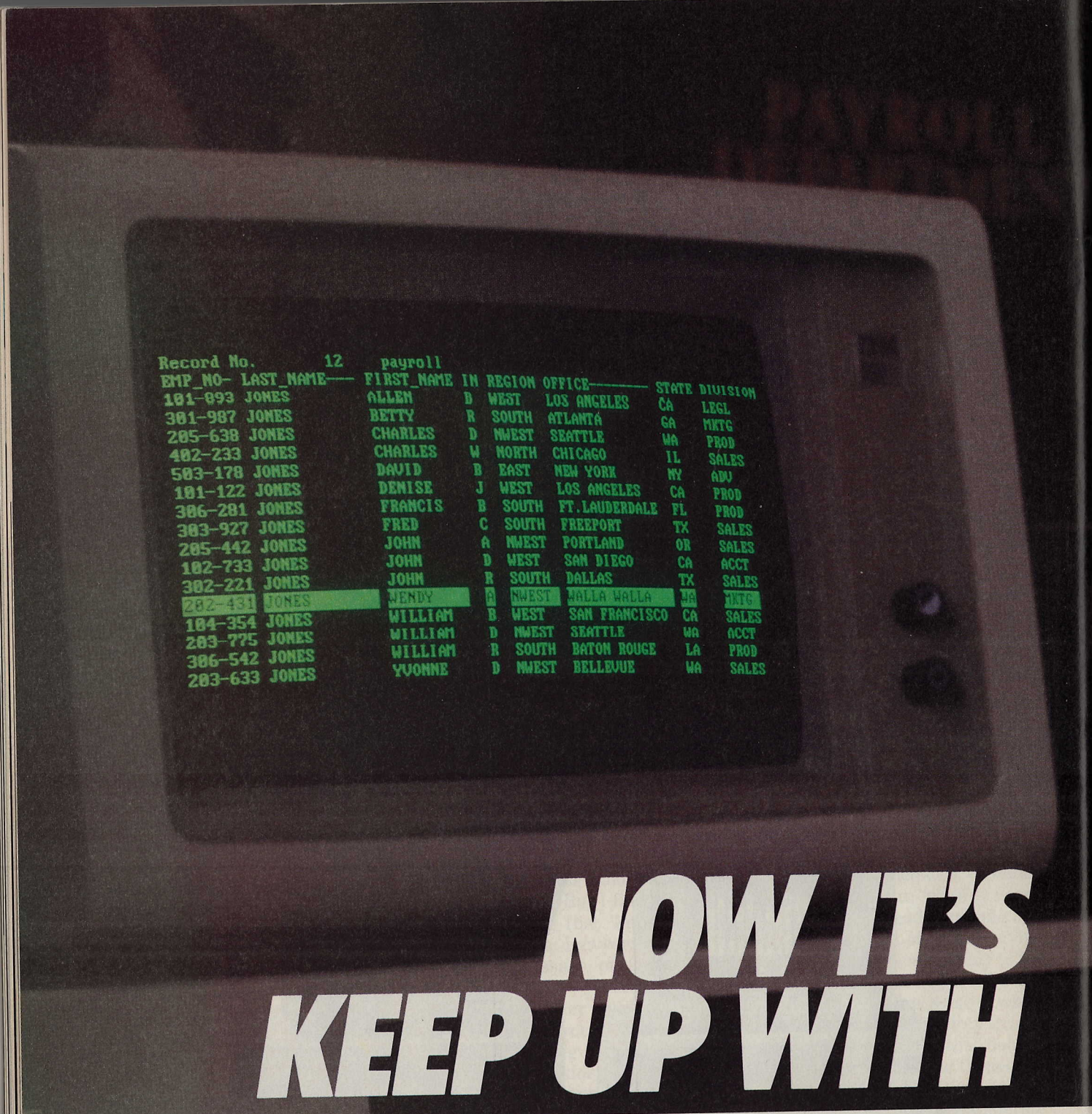
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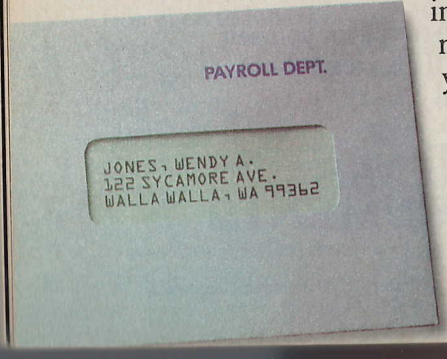

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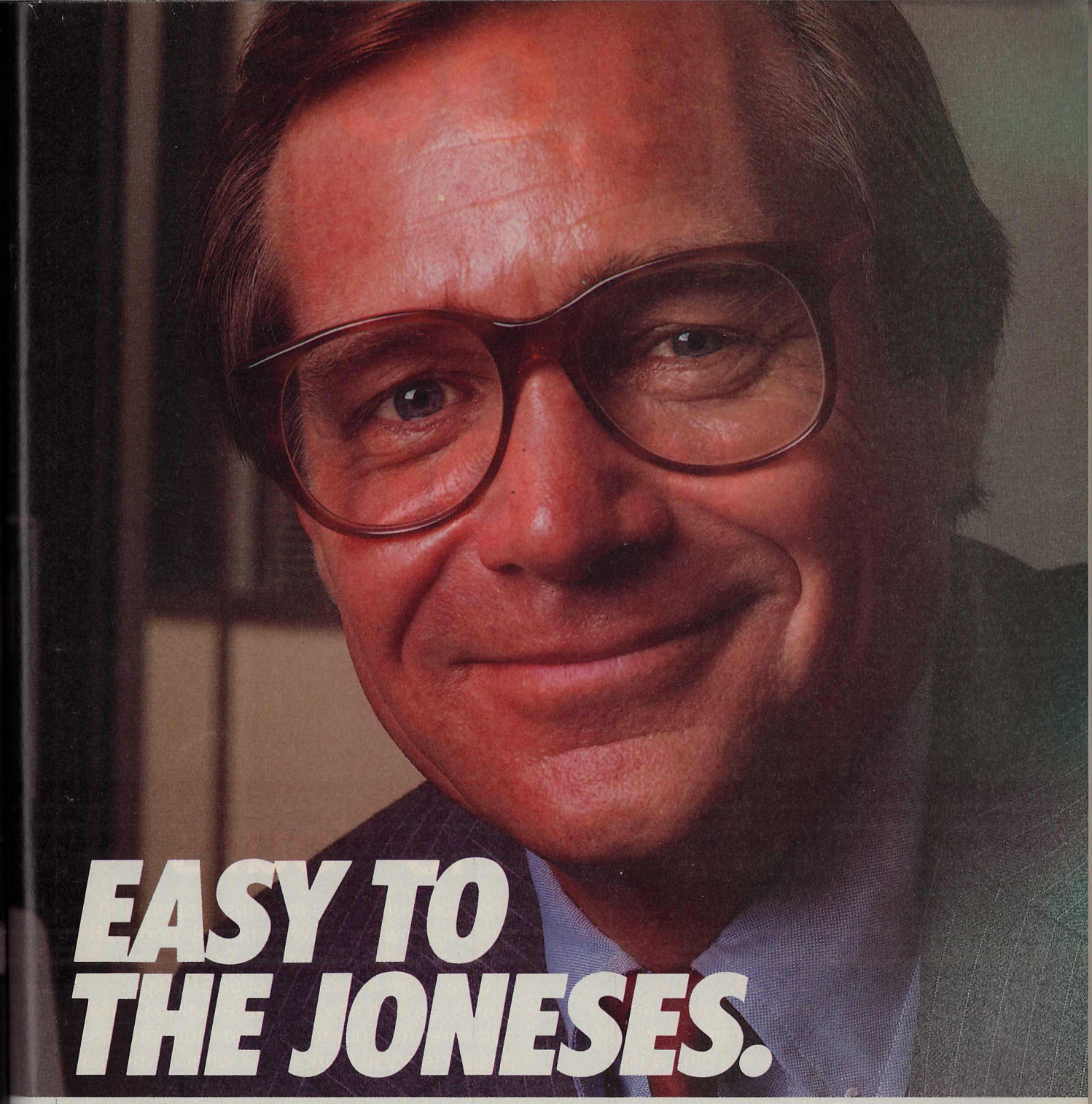

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Innovation, Where Are You?

New packaging hardly disguises old technology

by A. Richard Immel

Lightning speed. Immense processing power. Smaller. Faster. Better. And on and on.

According to conventional wisdom, the hardware in the computer industry—which today is the epitome of High Tech—is changing at such blinding speed that nobody can keep up with it. Consider this example from a mailer I just received:

Dear Fellow Computerist:

Today, the "leading edge" of computer technology is moving at the speed of light. Seemingly overnight, your computing skill is challenged by integrated environments . . . multiuser, multitask communications . . . interactive graphics. . . and more.

Or consider this excerpt from a newspaper column about how to arrange upkeep for aging computers ("aging" meaning two or three years old):

A microcomputer generation is as brief as its prefix. . . Generally electronic technology leaps ahead of itself so rapidly that the machine never does reach old age, at least not in public. Long before that, it is consigned either to the closet or to a salesman as a trade-in on a new Goldcircuit IV with hyperdisks.

But something is wrong with all this talk of innovations—the facts don't match the image. I made a mental survey of the state of the art in microcomputer technology, and this is what I came up with:

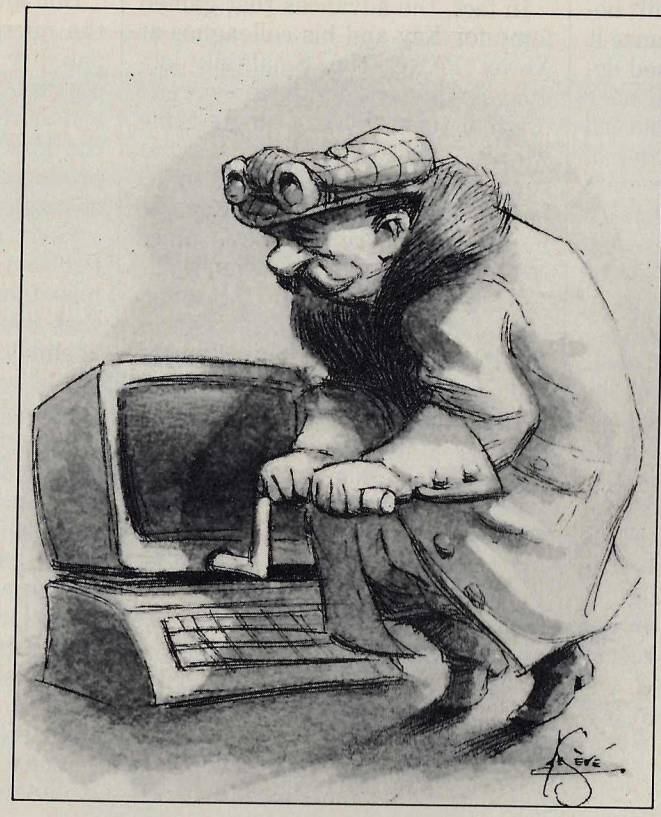

Illustration by Peter de Seve

- Apple's new IIe and IIc have been warmed over from the original Apple II introduced in 1977. They're built around the 6502 processor designed in the early 1970s (chosen by original Apple II designer Steve Wozniak because it was cheap). The insides of the new machines are functionally similar to the original Apple II. Granted, Apple's Lisa and Macintosh are based on the Motorola 68000, one of the newer generation of processors. But both machines are committed to mice and windows, two technologies introduced in the early 1960s.
- The Commodore 64, the largest-selling computer in the U.S., uses a processor similar to the one that powers the Apple II line. It's been modified slightly so that it's cheaper to manufacture. Nonetheless, Commodore offers more elaborate graphics than a standard IBM PC.
- IBM, whose PC embodies Apple's notion of open architecture to encourage outsiders to provide add-on enhancements, uses the 8088 processor, a mid-1970s chip derived from the little-used Intel 8086 16-bit processor.
- What about AT&T, famous for its Bell Laboratories, birthplace of the transistor? AT&T is push-

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ing its latest incarnation of an ancient operating system called Unix (designed in 1969 for timesharing use on minicomputers). Unfortunately, Unix doesn't run on AT&T's newest and least expensive IBM-compatible microcomputer.

• Then there are the Japanese. You remember them? They're the ones who were going to knock the socks off the U.S. microcomputer industry just as they did with TVs, cars, and VCRs. The latest consumer product from Japan is called the MSX standard, and guess what? It's based on the Z80 8-bit microprocessor that was so popular in this country five years ago.

• And there's the most precious computer in America, the Grid Compass. At $12,000 plus, Grid is the Ferrari of lap computers—the closest any mass-market micro has come to the state of the art. But possibly it's too close. With its electroluminescent flat-panel screen, unique integrated software, magnesium case, bubble memory, and built-in telephone, the Grid Compass represents what is called the engineering approach to building a machine: it was built because it was possible, not because it fulfilled any strongly expressed demand in the marketplace. Grid sales have never been what you would call robust—something on the order of 3000 units as of 1984. Its greatest success so far was its selection for the Museum of Modern Art's permanent design collection.

Reinventing the Wheel

One computerist who has a clear perspective on the tendency of the U.S. computer industry to repackage old technology is 43-year-old Alan Kay, formerly of Xerox's Palo Alto Research Center (PARC), later with Atari, and currently working for Apple. Kay is a real old-timer in this business—he's been designing computers, inventing computer languages, and developing new computer concepts for 20 years.

Last summer at a Pioneer Day conference in San Francisco, a celebration of computer nostalgia put on by Sybex, the Berkeley computer-book publisher, Kay trotted out some interesting dates that put the state of the art into historical perspective. He noted, for example, that 1962 gave us the first "personal" stand-alone computer, designed by Wes Clark at Lincoln Labs; at $18,000 each, about 2000 were sold as laboratory machines. In the same year, a light pen was first used as an input device and windows first appeared on a computer screen. The first mouse-style pointing device scurried across a desktop in 1963, and the first touch tablet was fingered in 1968. But it wasn't until 1972 that Kay himself first used the sobriquet personal computer.

Kay's remarks sent me back to my files, where I dug out notes from an interview I did back when he had just become Atari's chief scientist. Kay's thesis then—and it's one he still espouses on the lecture circuit—was the brutal idea that not only was modern microcomputer technology a throwback to earlier days, in most cases it wasn't even as good.

In fact, the advances that gained fame for Kay and his colleagues at Xerox PARC—the Smalltalk language, windows, and mice—weren't original then. "Every single thing we did there was a second pass at some idea that either we or somebody else had in the 1960s," Kay told me. "This time we were determined to do it right." Yet even when it had been done right, much of the new technology developed at Xerox PARC was never embraced by the industry.

Video display technology is a prime example. Techniques for creating visually comfortable displays with dark characters on a light background were developed 15 years ago and used on Xerox PARC experimental machines as well as the commercial Xerox Star workstation. But these displays didn't appear on micros until Apple developed the Lisa two years ago (the same display appears on the Macintosh).

Thus it becomes clear that obsolescence is seldom caused by technological advances per se. It is more likely the result of a deliberate decision by a company to make a newer product incompatible with an older one. Commodore is good at this, Tandy almost invented the technique, Apple has learned how to do it, and IBM, which became a corporate giant by doing it in the mainframe business, is now flirting with the idea for its microcomputers.

The microcomputer industry seems to be drawing closer to the auto industry in a number of respects: both practice planned obsolescence of their products, both require large investments in manufacturing facilities, and both are averse to radical change. Finally, both rely heavily on Elmer Wheeler's 50-year-old sales philosophy: sell the sizzle, not the steak. Look, for example, at the latest convergence of cars and computers, where fancy digital displays give the driver the same old data in a format that may well be harder to comprehend than it was in its original form.

Phantom Tech

But another unseemly aspect of the microcomputer business is apparently unique to this industry: the phantomization of technology. More and more companies have developed the knack of announcing phantom products that live only in the pages of magazines and nowhere else.

For example, the last days of the Osborne Computer Corporation promised an IBM-compatible portable that was never produced. Ovation Technologies enticed the computer world with high-powered software that, as I write this, has not yet come off the drawing board. Gavilan, the company that developed a marvelous lap-sized, flat-screen computer generally known as the poor man's Grid, has, to all appearances, gone through the entire business cycle, from start-up through second-generation product to layoffs and financial difficulties, without ever capturing a market share.

This past year Apple Computer added a fascinating twist to phantom technology by reclassifying the

A. Richard Immel is a contributing editor of *Popular Computing*.

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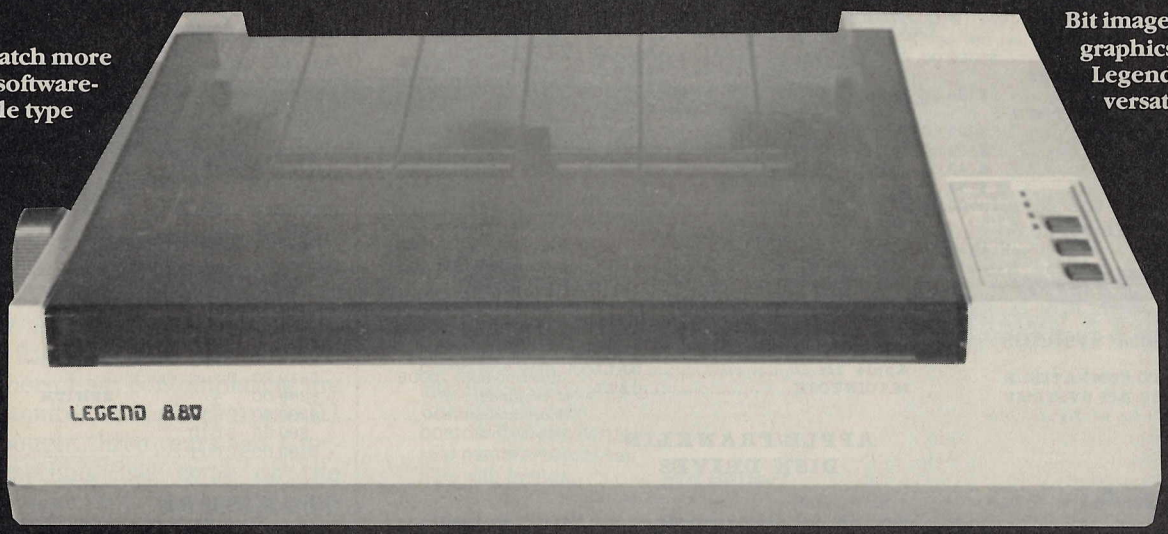

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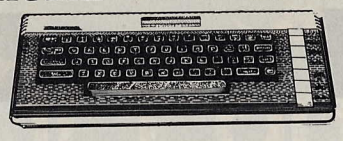

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Motorola 68000 microprocessor, the one that lurks inside Lisa and Macintosh, as a 32-bit processor. Without getting into a technical discussion that might blow my credibility, let me state that heretofore Motorola and almost everyone who used the 68000 had considered it a 16-bit microprocessor with some 32-bit attributes. But as if by magic, the 68000 became a full-fledged 32-bit processor in Apple products.

I think I know why the company did this. In its battle to wrest a share of the business-computing market from IBM, Apple wants to look like a technological innovator. In the context of the bit wars, think of the advantages of having a 32-bit computer in your arsenal, especially when the only cost is a press release. In fact, IBM pioneered phantom technology by calling the PC a 16-bit machine after its Intel 8088 processor had actually been tuned down from a 16-bit 8086 processor so it could run cheaper and more readily available 8-bit software.

And here I sit, contemplating my own computer, an "aging" Apple III that I bought three years ago. Curiously, nothing has come on the market since then that is any more suitable for writing, my primary application. I've tinkered a bit with the machine, installing a clock and a gizmo that improves the look of characters on the screen by filling in the spaces between dots. And recently I added another 128K bytes of memory, not because I really needed it—I have yet to run out of memory on anything I've done—but because the price was finally right and I might want to try some programs that require a 256K-byte machine.

What am I missing? Well, I don't have a mouse, but then I couldn't very well use one anyway because I keep my computer on a typing stand where there's no room for the little critter to do its tricks. Besides, I've tried mice on other machines and I don't like them. My disk-drive capacity is skimpy, a characteristic of the Apple II and III line, but you get used to it; if I really need the space, I can always buy a hard disk. If I want a color display, which right now I can't afford, I can hook up an RGB color monitor, something the Macintosh people can't do even with their 512K-byte "Fat Macs." And I have yet to find a keyboard that feels any better to me.

Oh, I suppose someday I'll be tempted to buy a new Goldcircuit IV with hyperdisks, the latest integrated mouser, front and side windows, and a turbocharged processor that does the quarter mile in 15.1, but when that time comes, I'll just think of Alan Kay and lift my gaze to the wall, where I've taped these words next to the monitor:

The thing that hath been, it is that which shall be; and that which is done is that which shall be done; and there is no new thing under the sun.

—Ecclesiastes 1:9 □

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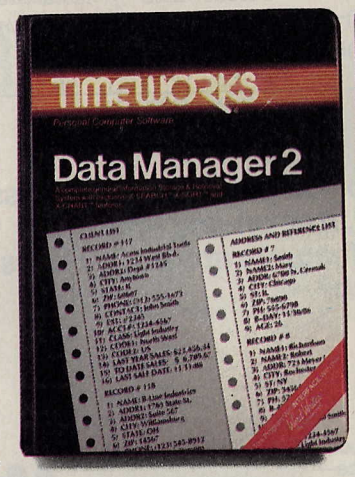

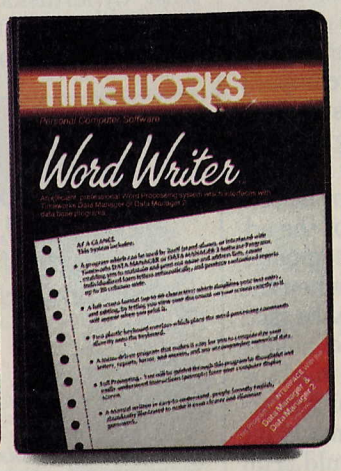

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Computer Illusions

Fractals make mathematical magic in the movies

by Matthew McClure

Math is beautiful, our teachers said. But some of us just couldn't see beyond the black formulas on white paper.

That was before we could savor the haunting color landscape of an alien planet or step inside an atom. Computer graphics created with math and human imagination take us where we've never been—and to some places we'll never go. Today's masters of computerized illusions for movies and video games use equations to mirror nature and to create fictional environments and events: boulders so real we can almost feel their texture and planets that explode with startling reality.

Such simulations rely heavily on the computer's ability to perform high-speed iterative functions, where the computer repeats an operation, incorporating the results of each calculation into the next one. You enter an equation to make a design, and the computer draws it on the screen, changes it slightly, draws it next to the first one, changes it slightly, and draws it again. After a few minutes and a few thousand iterations, you and the computer have drawn a moon rock, the end product of your imagination and a rendering algorithm (the series of steps the computer follows to create a picture).

Algorithms for generating new images don't require a complete set of specifications. You just describe a set of rules—a design grammar—that will generate an image. You change a variable or two and keep computing until you have a design you like. You draw an oak tree, change the variables, and create an elm, for example.

Lucasfilm's Alvy Ray Smith put White Sands together using a fractal-generating algorithm for the plant, another program for the leaves, and a third for the lighting.

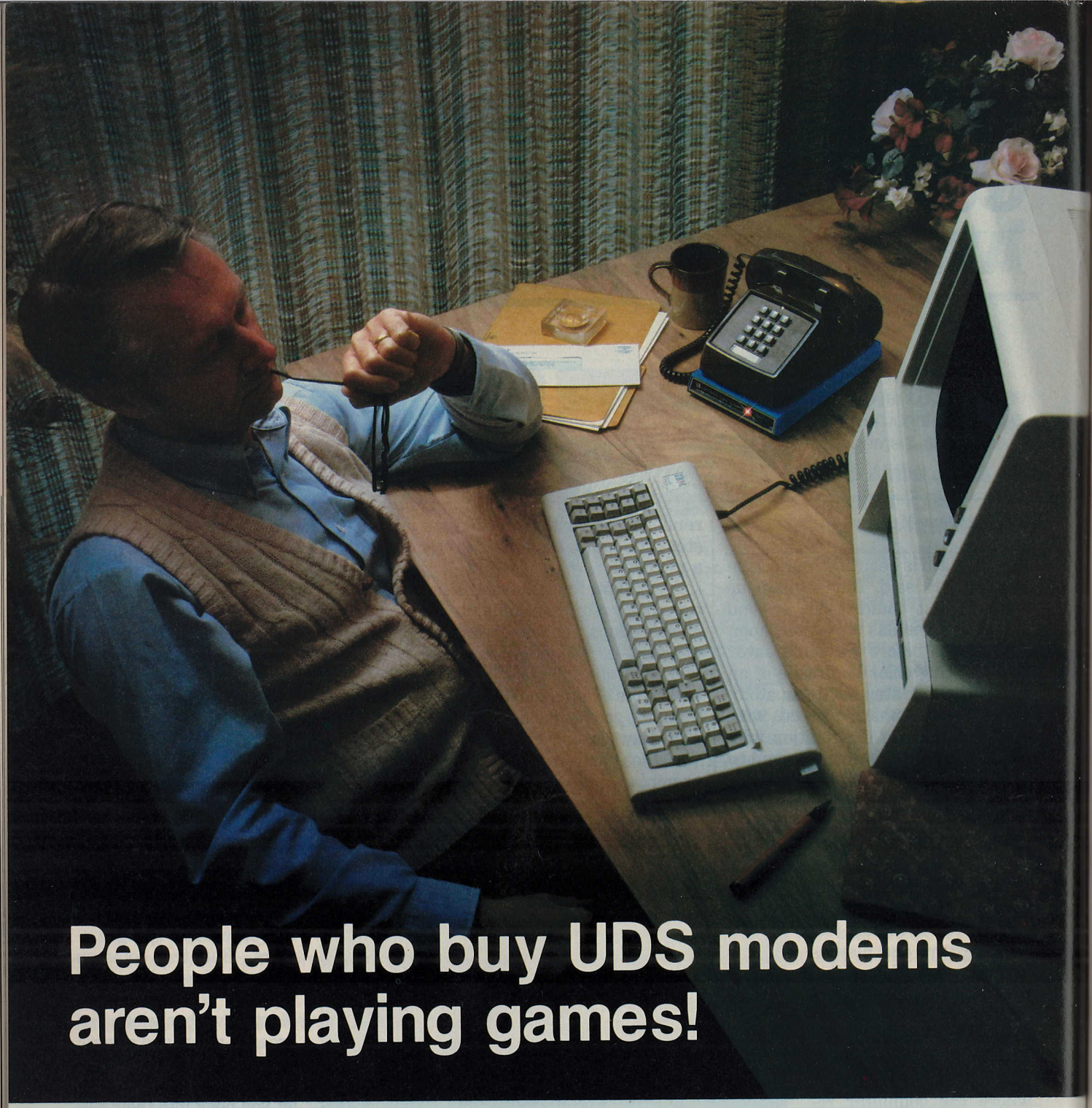
Fun at Lucasfilm

Such mathematical magic is all in a day's work at Lucasfilm Ltd. in San Rafael, California. Lucasfilm's Loren Carpenter puts it this way: "We have fun." Using algorithms, Lucasfilm generated the Genesis sequence in *Star Trek II* and the force field around the moon of Endor in *Return of the Jedi*. The firm designed and built its own graphics computer, the Pixar 2-D. Pixar can generate a complete movie-frame image in two minutes, and it doesn't mind working around the clock to create as many as 720 frames per day. Even Disney would've been impressed.

Programmers and engineers are now working on Pixar 3-D, which will produce three-dimensional representations with multiple uses: backgrounds for live actors, animated cartoons, and all kinds of simulations. Flexibility is obviously a key qualification for Lucasfilm programmers. But the common thread in their educational tapestry is mathematics. Most have bachelor's degrees in math, and several have advanced degrees.

Magicians usually won't let you peek into their bag of tricks. Fortunately, Loren Carpenter doesn't mind. The trick in his mathematical bag is fractal geometry, a new tool for designing computer graphics. A fractal-generating algorithm can produce an alien rock that's just what you'd expect to see on Mars. Change the variables and the screen will display plants that didn't evolve on Earth, but which surely could have somewhere else.

Photograph courtesy of Lucasfilm



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What's a Fractal?

Yellow plants with purple leaves growing in profusion on Planet X are certainly food for thought—and an interesting graphic display. But what exactly is a fractal? Fractals go a step beyond our tendency to perceive things only in one, two, or three dimensions. Carpenter defines them as "infinitely crinkly objects"—fractional structures that occupy the space between the points, lines, planes, and volumes of traditional geometry. Dimensions become relative rather than absolute.

A line is a line is a line. But a line with infinite wiggles will eventually fill a sheet of paper with increasing fractal dimensions as it progresses from one dimension (a line) to two (a plane). Similarly, if you then crinkle the sheet, it acquires volume as it approaches the third, or cubic, dimension.

On a larger scale, you can compare the crinkly sheet to the surface of a landscape. "For every latitude and longitude, there's an altitude," Carpenter explains. "An average landscape might be a 2.3-dimensional fractal." Following the same logic, the Great Plains, with fewer hills and valleys, might have a 2.1 fractal dimension, and the Rockies would soar to 2.7.

Fractals also can extend beyond the third dimension, although calculations become more difficult. A

About the BASIC Program:

This program was written in BASICA for the IBM PC and compatibles. It will run with slight modification on most versions of BASIC. Line 10 sets the graphic mode for the PC, clears the screen, and sets the dimensions for the arrays the program will use. Line 30 inputs 7 numbers from the keyboard. Be sure to separate the numbers with commas.

The variables are:

X: The beginning x-coordinate [e.g., 1]
Y: The beginning y-coordinate [e.g., 90]
XSTK(SP): The ending x-coordinate [e.g., 600]
YSTK(SP): The ending y-coordinate [e.g., 90]
XTOL: The tolerance for the x-coordinate—determined by the resolution of your screen—a number from 4 to 6 works pretty well.
M: The fractal dimension you want to choose [e.g., 1.1]
V: The roughness you want the curve to have [values between 0 and slightly greater than 1, like 0.4]

Once you've input these numbers, the program will produce a drawing that looks like a mountain or the outline of a cloud. Changing the variables M and V will show you how the algorithm behaves.

```
10 SCREEN 2: KEY OFF: CLS: DIM XSTK(120),YSTK(120)
20 SP=1
30 INPUT X, Y, XSTK(SP), YSTK(SP), XTOL, M, V
40 IF (XSTK(SP) - X) < XTOL THEN GOTO 100
50 XM = .5 * (XSTK(SP) + X)
60 YM = .5 * (YSTK(SP) + Y) + (XSTK(SP) - X) * V * RND(0)
70 V = V * M
80 SP = SP + 1 : XSTK(SP) = XM : YSTK(SP) = YM
90 GOTO 40
100 LINE (X,Y) - (XSTK(SP), YSTK(SP))
110 X = XSTK(SP) : Y = YSTK(SP) : SP = SP - 1
120 V = V/M
130 IF SP > 0 THEN GOTO 40
140 END
```

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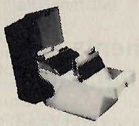

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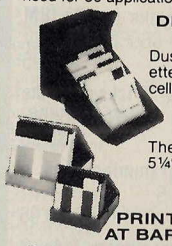

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cloud is a good example, Carpenter said. "In addition to latitude, longitude, and altitude, you have humidity. Physicists usually assign the fourth dimension to time, but it can be anything that affects a three-dimensional matrix. To the mathematician, it's just another variable. In a way, fractals relate to traditional topology [the study of geometric configurations] in the same way calculus relates to traditional mathematics. Calculus involves continuous functions—areas and volumes, motions and accelerations—with everything varying constantly so that you have a continuum of values. With fractals, you have a continuum of dimensions."

Carpenter's work stems from a 1980 paper he wrote for the Association for Computing Machinery's Special Interest Group on Computer Graphics (SIGGRAPH). Its premise is that the repetition of more or less random patterns, called stochastic processes, can create images surprisingly like those found in nature. He also developed one of the first fractal-generating algorithms, with Alain Fournier of the University of Toronto and Don Fussell of the University of Texas.

The algorithm uses controlled random numbers to generate irregular surface detail. To generate a landscape, the designer keys in a global shape, including elevations for mountain peaks and valleys, and the computer, following the algorithm, constructs triangles that subdivide recursively into smaller triangles, and so on. As they mold a realistic landscape, the triangles eventually become too small to be distinguished.

Carpenter's fundamental approach to generating fractals is shown in his 14-line BASIC program (see "About the BASIC Program," page 51). "You pick an arbitrary point in a complex plane, stick it in the computer and grind on it, and you get another point coming out," he said. "The fractal algorithm takes the number and puts it back in the equation, and you keep cycling through." Just like magic.

Two Kinds of Fractals

Carpenter points out that there are two general classes of fractals: mathematical and natural. Mathematical fractals repeat an identical form. "These rigid patterns are not random," he said. "At any size or scale, the dimensions remain constant." Natural fractals are those that generate random patterns like the ones found in nature, he added. "There are all kinds. Clouds are fractals, for example. The pattern of stars in the sky is fractal; it is somewhere between a point set and a line, with a fractal dimension between 0 and 1. Coastlines and the craters on the moon are fractal, and so are branches of arteries and fluid networks in organisms.

"I don't think anyone yet has a good answer to why the universe has so many fractal properties. My guess is that there's an explanation at the frontier of physics. At a quantum level, the universe begins to look strange.... Under certain conditions, things happening in one place correlate with events elsewhere—in a fashion that seems to involve communication greater than the speed of light. There's an explanation there somewhere, I think, for why the universe is fractal."

Fractals may well provide a clearer look at our universe. That remains to be seen. In the meantime, they allow us to see some enchanting things that aren't there at all, in a make-believe universe created with algorithms, subroutines, and programs. A fractal generator creates a shape, and the perspective algorithm puts it in just the right spot on the screen. The fractal generator then adds some texture, and the lighting algorithm makes the whole scene look like a Maxfield Parrish painting, even though it was generated by mathematics and implemented by computers.

Add a picture of Harrison Ford looking off into the distance, and you have the stuff of which visual drama is made. □

Matthew McClure is research editor for the *Whole Earth Review*. Formerly managing editor for the *Whole Earth Software Catalog*, he lives in Petaluma, California, with his wife and two daughters.

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Logo: Fad or Fixture?

Popularity doesn't always reflect a true understanding of purposes

by Dan Watt

The popularity of Logo is worthy of serious attention. In early 1982, two versions of the language became available for the Apple II. Now Logo is available for virtually every popular microcomputer. Logo has been translated into Spanish, French, and German. Of course, other computer languages and software products enjoy worldwide popularity, but Logo's use creates a different effect.

Logo differs from other popular computer languages because it also includes activities for learning mathematics. Seymour Papert, Logo's principal developer and author of the best-selling book *Mindstorms*, describes Logo as a "mathland." This is an environment in which learning mathematics could be a natural experience for children, "more like learning French by living in France than like trying to learn it through the unnatural process of . . .foreign language instruction in classrooms." Papert claims that Logo has "no threshold and no ceiling"—that it can be used by expert programmers as well as by beginners. Thus the same language that introduces a child to the power of a computer can teach important principles of computer science to college students. It depends on how you use it.

Despite its potential as an advanced language, current Logo use remains confined to beginning programmers. Perhaps this is because some Logo advocates promoted the language as being so "easy to learn" that it could be introduced with little teacher preparation. Others cited Papert's writings as evidence that Logo is best learned when children explore mathland on their own, without formal teaching or curriculum. Throughout the country, school districts anxious to get their computer literacy programs off the ground selected Logo as the best available choice for their elementary schools. And its use continues to spread more rapidly than the knowledge of how to teach Papert's "powerful ideas."

Illustration by Joan Hall

For example, consider the following examination of Logo's power. We begin with two key features—the turtle and extensibility. A triangular cursor, the turtle draws lines as it moves around on a video screen and responds to commands such as FORWARD, BACK, RIGHT, and LEFT. These words are expected to be part of any person's vocabulary. Thus, drawing with the turtle to create geometric designs and line drawings is the most common introductory Logo activity. And the computer programming becomes less a manipulation of abstract symbols than a concrete, familiar activity. Logo's extensibility lets you combine simple commands into procedures or new commands that you can then use to build other new commands. In effect, each

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Logo programmer creates a personal computer language designed to solve particular problems.

That's just the beginning. At the advanced level, Logo includes programming concepts borrowed from LISP (an acronym for LISt Processing), a language designed for Artificial Intelligence software development. Logo manipulates information in hierarchical lists (lists within lists within lists), the data structure favored for AI applications. And like LISP, Logo allows recursion, a process that permits procedures to call up copies of themselves. Because these procedures are stored as lists, Logo procedures can create new procedures or even modify themselves. Needless to say, these features are not necessarily easy to learn. And as a consequence, they are rarely found as part of a typical Logo curriculum.

The Flowering of an Idea

But even for the student who never goes beyond introductory turtle graphics, Logo can provide a valuable learning experience. Consider the drawing of a flower like the one shown in the illustration on page 54. The student begins by carefully moving the turtle, trying to create a particular image. With the design completed, the set of commands can be stored as a procedure—perhaps FLOWER1:

```
TO FLOWER1
REPEAT 9 [FORWARD 5 RIGHT 10]
RIGHT 90
REPEAT 9 [FORWARD 5 RIGHT 10]
RIGHT 90
FORWARD 100
REPEAT 6 [REPEAT 9 [FORWARD 5 RIGHT 10]
  RIGHT 90 REPEAT 9 [FORWARD 5 RIGHT 10]
  RIGHT 90 RIGHT 60]
END
```

The student who wrote this procedure achieved many of the fundamental objectives in standard computer literacy guidelines—controlling the computer to perform specific tasks, using a screen editor to create simple programs, and storing programs on a disk or cassette.

Dan Watt is a contributing editor of *Popular Computing* and the author of *Learning with Logo* and *Learning with Apple Logo* (BYTE Books/McGraw-Hill, 1983).

Additionally, the student may learn some of the mathematics embedded in the geometric world of the turtle. But unless the learning goes beyond this point, Logo only provides an introductory lesson in computer literacy. The language's real learning potential remains out of the student's grasp.

For example, the same flower design could be drawn more elegantly by the procedure FLOWER2 and its subprocedures, LEAF, STEM, and BLOSSOM. Simply and powerfully, a complex problem is subdivided into smaller problems. And in this case, BLOSSOM uses LEAF as a subprocedure, illustrating how one procedure can become a building block for another. BLOSSOM also illustrates a useful geometric principle: to complete a closed figure, the turtle must turn through a series of rotations that add up to 360 degrees:

```
TO FLOWER2
LEAF
STEM
BLOSSOM
END

TO LEAF
REPEAT 9 [FORWARD 5 RIGHT 10]
RIGHT 90
REPEAT 9 [FORWARD 5 RIGHT 10]
RIGHT 90
END

TO STEM
FORWARD 100
END

TO BLOSSOM
REPEAT 6 [LEAF RIGHT 60]
END
```

Eight years of experience in teaching Logo clearly indicates that students require a great deal of teacher support to move from procedures like FLOWER1 to procedures like FLOWER2. One research study confirms that "most sixth graders tend to write long, step-by-step, unstructured procedures" when they are working with "minimal teacher intervention." Without teachers who understand the ideas of Logo and know how to guide children to use and understand them, the power and elegance of the language is lost.

Creating Logo Cultures

Logo as it is now being used may be a fine vehicle for achieving minimal objectives in the area of computer literacy. But I do not believe that the higher-level objectives of enhanced problem solving and reasoning abilities will be achieved unless educators can construct a Logo culture for children to learn in. If we persist in thinking of Logo as an "easy" computer language, good only for introducing computers to children, we'll be missing out on a major opportunity to change the way that teaching and learning happen in our society. On the other hand, if we judge today's Logo classrooms according to the long-range goals articulated by Seymour Papert, we may also lose this opportunity before it gets off the ground.

In a recent television interview Papert said, "It's not that Logo is easy; it's easy to get into, but once you're in there, you can progress to the most sophisticated ideas in the world of computing. Just as in English, you can start off with baby talk, but the same language is also the vehicle for expression of poets and philosophers."

Imagine asking a child in fourth grade to write a composition if that child had never written anything before, had never read or heard a story, and had just learned the alphabet. This compares to what we ask of children in Logo classrooms today. We sit them down in front of computers, show them a few Logo commands and expect them to create their own projects and discover powerful mathematical concepts. Children need models and examples to provide the raw material for their creativity and their discoveries. And they need teachers who are knowledgeable about both the content and the process of Logo learning.

Ultimately, our long-range educational goal for our children should be to have teachers of Logo who know the language as well as teachers of English know English—Logo should be part of the very fabric of their lives. It will be a number of years before we have a cadre of educators who meet this standard, but before that can happen, we must agree that Logo ought to be more than an "easy" introduction to computers. □

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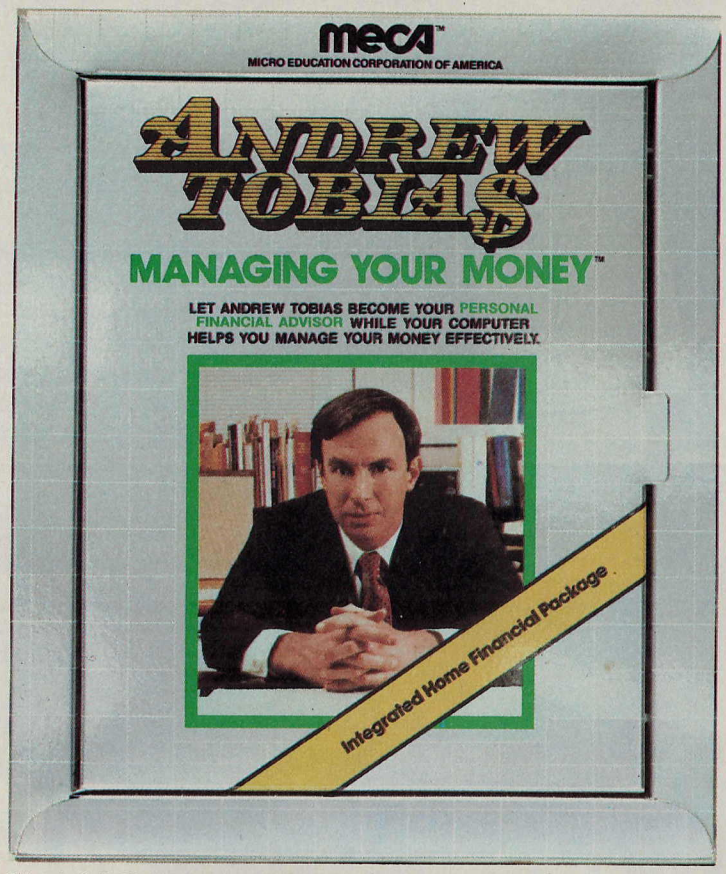
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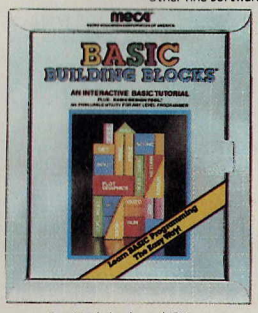

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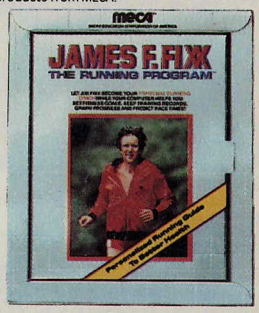

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Information Management

A computer at home could spawn a lucrative career

by Jerry Pournelle

When, back in the 1970s, David Ahl proposed to Digital Equipment Corp. that it build and market the first microcomputer, Kenneth Olsen, chief executive officer of DEC, said, "Why would anyone want a computer in their home?"

The question was probably genuine, but there may have been an element of fear and loathing in it. DEC was arguably the most innovative of the "seven dwarves" (IBM and the seven dwarves then comprised the known computer universe) and manufactured minicomputers rather than big mainframes; but DEC still believed that computers should be kept in central facilities to be served and serviced by a priesthood of dedicated experts.

The micro revolution changed that permanently. At first micros had little direct impact within the mainframe and mini worlds, but they changed people's perspectives. Company executives began to ask *why* you couldn't have standard ways of doing things; why programs needed whole teams of expensive people to "maintain" them; why there was so little competition in the software arena. All that might not have been foreseen when David Ahl proposed the micro—but if it had been, most of the computer "experts" of that time would have hated the whole idea.

It soon became obvious that lots of people wanted computers in their homes. It wasn't so obvious that they had rational reasons for wanting them. Although DEC's rejection of the opportunity to become the first microcomputer company is a good candidate for *the* all-time silly marketing decision, it was some time before there were any obvious answers to the question "What do you do with a home computer?"

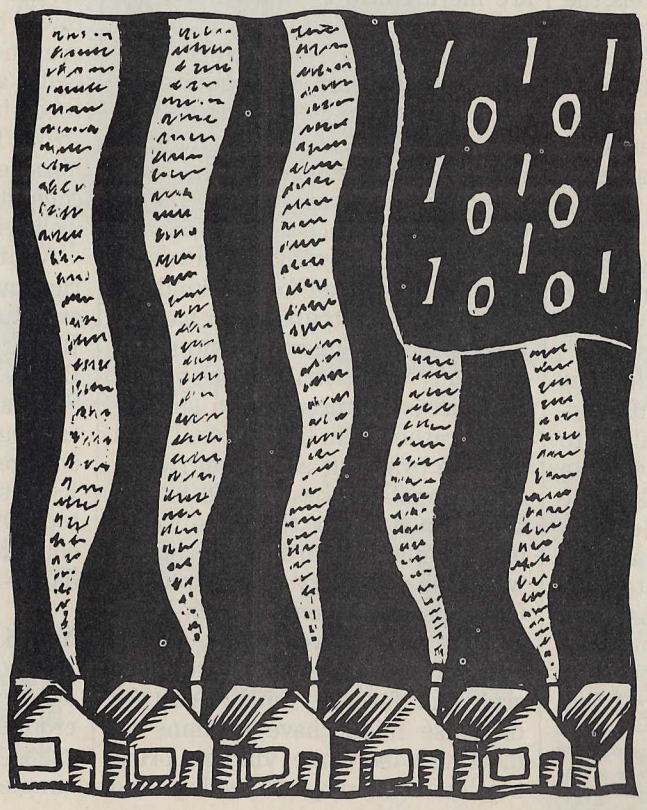

Illustration by Anthony Russo

People Doing Stuff

The problem with the DEC CEO's analysis was that he thought of people as being "at work" and "at home," and when they're at home they're not doing anything; and of course that isn't true. People do all kinds of things when they're not working. They organize charity events. They put on school plays. They lead Boy Scout troops, organize science fiction conventions, collect plates, marbles, matchbooks, and old whiskey bottles; maintain wine cellars, manage bank accounts, pay taxes, fly airplanes, organize church socials and automobile rallies—the list is endless. Leaving out word processing—and many of our activities would be aided by an ability to generate lots of letters even if they don't require them—small computers can be invaluable through their data-manipulation abilities alone. There's little we do that can't be helped by computerizing data. Nearly every one of those activities can be helped by

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good database management.

When I first acquired Ezekial, my friend who happened to be a Z80 microcomputer, one of the first programs I wrote for him was a "minimum database." This simple BASIC program has proved to be one of the most valuable tools I have ever had. When I led my Boy Scouts on a 50-mile hike into the High Sierra, my little database kept track of all the food: who carried it, what meal it would be used in, which patrol would cook and which would do cleanup, etc. We generated lists sorted in various ways: one list showed each boy's pack load. Another showed exactly what ingredients were needed in each meal. I could look under Tuesday, Lunch, and discover precisely what we would have, then find out which boy carried each ingredient. The result was that we were able to enjoy the activity rather than fuss over the housekeeping.

The minimum database keeps track of boxes of files, research papers, incoming software. These are business activities for me—but the program could just as easily be keeping track of plate collections, the wine cellar, my books and who has borrowed them, or the kids' homework assignments. Database programs help organize bake sales, keep track of acolyte assignments in church, and run bridge tournaments.

Better Your Position

Clearly, information management and servicing is a growth industry. Right now, many people are waiting for computers to get "user friendly" (and do all the work) before they get involved with the machines. More industrious computer users willing to do a little work—learning to use a micro is fun, but it does take time and attention—can get leagues ahead of those who merely wait. I've always said that microcomputers are great equalizers; a hard worker with a computer can compensate for poor education and even poor study habits by getting into the right field at the right time. The right time, of course, is *before* the big explosive growth happens. Database management is one of those "right" fields. Those who get into it now will have a head start when the *real* growth explosion comes—and in the meantime they'll have the present technology working for them. It's hard to lose.

The DEC CEO never thought of it, but it's possible to be "at work" while "at home"—especially if you have a home computer. The "electronic cottage" is quite real.

Nearly every small business has activities that can be improved by using database manipulation—and a lot of business people don't know how to do it. Providing database management for local businesses can be a lucrative part-time business easily done from the living room.

Maintaining Relations

There are many kinds of database management systems. Some, like the CODASYL system (invented by the same committee that brought you the COBOL programming language), are hierarchical in structure. They can be tailored to fit the exact needs of a data system. They are also complex, hard to learn, and require expertise even to get started. Just thinking about them can make a nonexpert user's head ache; at least it works that way with me. Fortunately, while such systems may be "better" for certain applications, they aren't needed for the kinds of things microcomputers can handle.

Databases for microcomputers are generally "relational," which means they are structured like a spreadsheet rather than like a tree. If you were to print out all the entries in a relational database, you'd have a table. Each row of the table would be a complete record. Each column would be one entry of that record. Columns might contain such information as employee name, salary, date hired, spouse's birthday, glove size, and favorite lunch. Another database might have columns indicating wine name, vintage, price, bottles remaining in cellar, and rating in number of "yums."

One neat thing about relational databases is that data can be put into them at any time and in any order and taken out in any order. The database can be sorted on any column—in the example above, you could have a table of wines sorted by vintage, another sorted by price, and yet another sorted by yums—or not sorted at all. Reports can be generated by multiple criteria: find all wines with ratings of three or more yums costing less than $12 and output them in ascending order of number of bottles remaining in the cellar.

Another advantage of databases is that data need be entered only once. You're not keeping multiple records. Small libraries, for example, can make one record per book. The columns of that database would include title, author, publisher, price, date acquired, acquisition number, condition, number of times circulated, etc., and also current borrower and due date. The database program can then generate many different kinds of reports: all books by a certain author; all books currently lent to a certain subscriber; all books borrowed before a certain date and now overdue; current value of inventory (with aging and depreciation factored in); most popular books; and so on. This is the sort of thing large libraries have done with big minicomputers; now small ones can do as well with micros.

Another advantage of less rigorous relational formats: their structures are more easily changed. If that same library changed from Dewey Decimal to, say, International Standard Book Number (ISBN), the catalog number alone would be changed. You could simply add ISBNs and keep the Dewey keys, too. Other data would only need changing to fit the ISBN standard—minor modifications.

You Know What I Mean...

In addition to relational databases, a new kind of micro database has cropped up recently. These are called "free form" systems. Most are simple to use. You pay for the sim-

---

Science fiction writer Jerry Pournelle, who joined the micro revolution seven years ago, is a contributing editor of *Popular Computing*.

"The machine works in a trouble-free manner, and is really a pleasure to use."
Robert J. Burdett—Oak Park, Illinois

"I was so pleased with the ADAM that I took it to school and gave a presentation to the entire school body. When I was finished many of my peers were raving over the ADAM."
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"You have an excellent machine for the home user. Smart LOGO and Smart Filer are excellent...Smart Keys make it very easy to use the software, even before you read the instructions completely."
Wayne Motel—Dyer, Indiana

"Your keyboard is better than the Apple.*"
Donald Prohaska—San Diego, California

"I find the word processor and the basic programming language to be very user friendly."
Gordon R. Franke—Kirksville, Missouri

"I am more than pleased with the operation of the machine, and not having any experience with computers, I am happy that finally someone has produced a machine not only at a reasonable cost, but one that you can nearly sit down and start using without any training period."
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plicity; most are also correspondingly less powerful than dBASE II and its analogs. On the other hand, you may not need the power; if all you're interested in doing is planning a wedding—invitations, RSVP received, chapel seating, gift, thank-you notes, etc.—then one of the simple database systems will probably be enough.

Some of the "free-form" systems have features you won't find with the more usual database. Savvy, for example, lets you misspell commands and search keys and ask incomplete questions, yet it's surprisingly fast at finding ambiguous data from vague information.

Think of the boon to reference librarians (to continue the example). Customers could ask for "all books dealing with eighteenth-century knitting and hand-dyeing"—or any reasonable form thereof. On the other hand, most reference librarians love such requests.

Storing Data

There are two ways to get information into a database. One is to put it there yourself. This can be tedious. Indeed, one reason those meal-planning and recipe programs—the ones that think about what you have in your cupboards and suggest tasty meals you can make from what you've got—never really caught on is because almost no one wants to keep the grocery inventory up to date.

That, incidentally, may change in the future. When computers are sufficiently appreciated that they're in every room (connected by a home network, of course) and never turned off, it won't be so hard to keep home food inventories. After all, nearly every food product (except meat and produce) already has a product symbol that can be read with a bar code reader. One of these days, I suspect, you'll be able to pass the bar code reader across the stuff as you put it away, and again as you use it, and that will be all the updating needed. A few years later, you may even be able to have the store clerk enter your purchases into your computer at the same time they're being rung up for sale.

Another possible application: I have a large slide collection, in no way organized. If I had a mind to, I could make bar code labels for each one, then key them to the slide content. Another label would go on the carousel or envelope. Assuming they stayed organized, I could select from them without looking through them all.

That's the future, though. For now, data entry is the tedious part of database management.

Using Money Rather Than Time

There are, however, ways to get information and possibly create a job from databases you don't create. There are a lot more of these "on-line" databases, or more correctly, information services, than most people suspect. *OMNI* magazine published a directory of over *one thousand* of them. You can, for a price, get information on everything from Arabian Horses and Air Charters, to the Zinc, Lead, and Cadmium abstracts.

Just thumbing through the *OMNI* directory gave me a dozen ideas for making money with my micro. The things I thought of would take too much time for too little return, but a couple of them would be fun; a way to do, if not well, then all right, by doing good. And all of them could happen without my leaving the house.

Accessing an on-line information service doesn't even take a computer. All you need is a terminal and a modem. It's better if you have a computer, though, because information can be taken from the on-line base, added to, manipulated, and distributed for gain; and that's better done by computer than by hand.

The cost of data storage has plummeted in the past few years. Even now you can get 480 megabytes of storage for $7000 or so—and that's almost enough to set up your own on-line information service. At the moment, available databases on-line are much overpriced. Few micro people know how to set them up and market them, and the big companies don't see why they should jump into the act. That will all change.

Get Started

I'm often asked which database management programs one ought to learn first. The answer, as with most questions, is "that depends." In fact, though, it doesn't much matter. You can start with one of the small, inexpensive database programs and work up, or you can bite the bullet and get dBASE II or one of its analogs.

One of the first things to do is get *Data Base Management Systems* by Dave Kruglinski (Osborne/McGraw-Hill, 1983). This book, while not superb, adequately provides a general introduction to database management theory and reviews several of the most popular microcomputer database programs. It isn't complete. In a field changing as rapidly as this one, completeness isn't possible. It is, though, more than your money's worth of introduction to the subject.

The *OMNI Online Database Directory* by Mike Edelhart and Owen Davies (Macmillan, 1983; get the paperback edition) introduces on-line information services, lists most of them, and explains how to access them.

The important thing is to jump in. I use computers primarily for writing; but even if small computers couldn't be used as word processors, I'd still have at least one simply to manage data. Computers were originally developed to process data, not words, and bringing powerful data-management techniques to the masses is a big part of the computer revolution. The ability to use database programs may be the most valuable skill a nonwriter will learn in the next five years. And without a doubt, managing information will become perhaps the most powerful reason for using your computer at home. □

Jerry Pournelle welcomes comments from members of the micro revolution. Write to him c/o *Popular Computing*, POB 397, Hancock, NH 03449. Jerry tries to answer all his mail but cannot promise individual replies.

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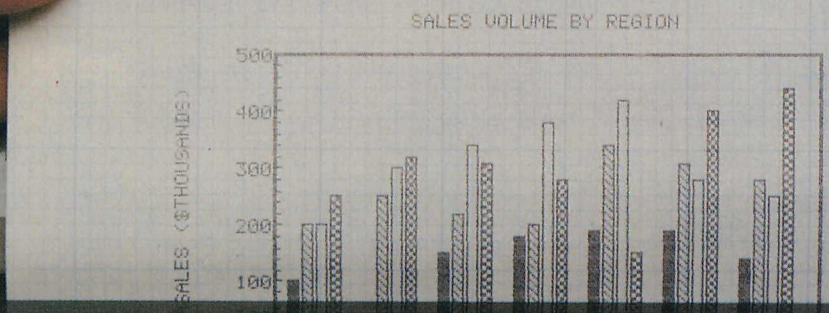
C	8400	38.1	5200	57.4	700	1.8	90	9.6	8



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POPULAR COMPUTING
JANUARY, 1985

THE TANDY 1000

Photographs by Elle Schuster

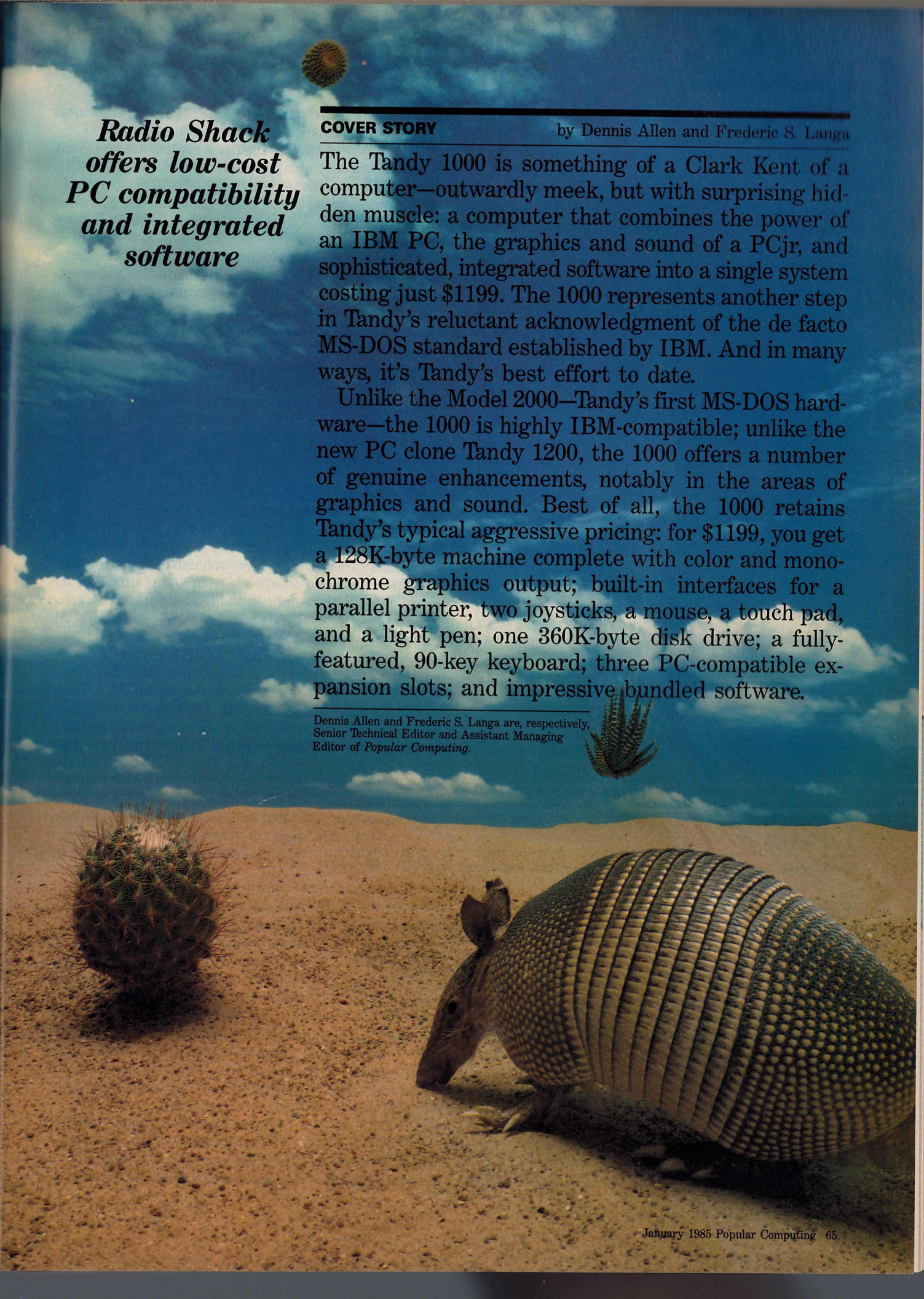
Radio Shack offers low-cost PC compatibility and integrated software

COVER STORY by Dennis Allen and Frederic S. Langa

The Tandy 1000 is something of a Clark Kent of a computer—outwardly meek, but with surprising hidden muscle: a computer that combines the power of an IBM PC, the graphics and sound of a PCjr, and sophisticated, integrated software into a single system costing just $1199. The 1000 represents another step in Tandy's reluctant acknowledgment of the de facto MS-DOS standard established by IBM. And in many ways, it's Tandy's best effort to date.

Unlike the Model 2000—Tandy's first MS-DOS hardware—the 1000 is highly IBM-compatible; unlike the new PC clone Tandy 1200, the 1000 offers a number of genuine enhancements, notably in the areas of graphics and sound. Best of all, the 1000 retains Tandy's typical aggressive pricing: for $1199, you get a 128K-byte machine complete with color and monochrome graphics output; built-in interfaces for a parallel printer, two joysticks, a mouse, a touch pad, and a light pen; one 360K-byte disk drive; a fully-featured, 90-key keyboard; three PC-compatible expansion slots; and impressive bundled software.

Dennis Allen and Frederic S. Langa are, respectively, Senior Technical Editor and Assistant Managing Editor of *Popular Computing*.



The bundled software includes MS-DOS, GW-BASIC, and Deskmate, a new integrated database, spreadsheet, telecommunications, word-processing, calendar/alarm, and electronic-mail package.

Overall, the Tandy 1000 seems to be a very versatile system at a very attractive price. We have to qualify our enthusiasm with a "seems to be," however, because our evaluation is based on a preproduction sample of the 1000. If the mass-produced units live up to the promise of the preproduction sample—and so far, we have no reason to expect otherwise—then the 1000 is likely to be a major contender in the MS-DOS marketplace.

Nuts and Bolts

The 1000 is built around an Intel 8088 microprocessor (same as the IBM PC), and uses a BIOS (Basic Input/Output System) that matches the IBM's closely enough to allow the 1000 to run Microsoft's Flight Simulator, Lotus Development's 1-2-3, and similar programs that are often used as touchstones of compatibility. We were even able to run IBM PC-DOS 3.0 (the IBM PC AT's operating system) on the 1000.

The machine bears a family resemblance to the Model 2000, though the 1000's system unit is notably smaller and has less detailing. A lighted power switch on its right panel serves as a reminder should you forget it's turned on, though the built-in cooling fan provides a constant audible reminder. A reset button, recessed in the lower front panel, lets you easily restart the system if your software decides to go on strike. The 90-key keyboard is the same high-quality unit supplied with the Tandy 2000 and includes 12 function keys, an ergonomically sculpted profile, a separate numeric keypad, cursor controls, and lighted Shift and Num Lock keys.

The basic system comes with one slimline PC-compatible double-sided/double-density 360K-byte disk drive. A second drive is available for $300, and the unit can operate an external hard-disk system through the addition of a third-party controller card. (Tandy also plans to offer a hard-disk interface board.)

The basic system also includes sockets on the front panel for a variety of input devices: up to two joysticks, a touch pad, or a mouse. Although the 1000 works only with input devices specifically designed for it or for Tandy's TRS-80 Color Computer, the 1000 is software-compatible with the PC.

The back panel provides access to interfaces for a parallel printer, a light pen, and the audio and video outputs. (Tandy has not yet released its light pen for the 1000, but the interface is there and is software-compatible with the PCjr.) Likewise, the three-voice sound system is compatible with PCjr software. The 1000 includes a small, built-in speaker, but for better sound, you can channel the audio output to your hi-fi via a phono jack.

The back panel's composite video output and RGB (red-green-blue) monitor interface both support graphics with 640 by 200 resolution (same as the PCjr). The composite output drives standard monochrome monitors, such as Tandy's new VM-2 green-phosphor 12-inch unit ($160), and provides monochrome graphics as well, but it will not drive monitors that use IBM's unique video circuitry. All this really means is that you can't use a monochrome monitor specifically designed to work with the IBM PC. For color video, you can connect the 1000 to a standard color television with an optional $25 RF modulator via the composite video output; or to a color monitor such as Tandy's new CM-2 13-inch IBM-compatible unit ($550) via the RGB interface.

Inside the system unit, the main board is equipped with 128K bytes of random-access memory (RAM) and an Intel 8088 as its central processing unit (CPU). There is no open socket to add an 8087 mathematics co-processor. The Tandy 1000 can be expanded to 640K bytes of RAM (same as the IBM PC). Memory is added in 128K-byte increments. The first 128K bytes comes on a plug-in expansion board for $300; you can add another 128K bytes of RAM to the same board for $150. The 1000 accepts two such boards to reach the machine's limit of 640K bytes of RAM.

Although the extra memory is listed as "optional," it really isn't. In order to get the most out of the machine, most users will need at least one memory expansion board. First, the 1000's BASIC is on disk, not in ROM (as it is on the PCjr). This means that the BASIC language must first be loaded from disk into RAM in order to run BASIC programs. Of course, this reduces the amount of memory available for programming and data.

Second, like the PCjr, the first 32K bytes of the 128K bytes of RAM in the basic system of the 1000 are used to manage the video display, further

AT A GLANCE: Tandy 1000

Manufacturer:	Tandy Corporation, 1800 One Tandy Center, Fort Worth, TX 76102, (817) 390-3011
Uses:	Business and personal computing
Standard Features:	Intel 8088 microprocessor, 128K bytes of RAM (expandable to 640K), monochrome and color-monitor interface with 640 by 200 resolution, double-sided/double-density 5¼-inch disk drive (360K-byte capacity), 90-key detachable keyboard with numeric keypad, 3-voice sound system, built-in speaker and audio output jack, parallel printer interface, 3 PC-compatible expansion bus slots, MS-DOS and Microsoft GW BASIC, Deskmate integrated software
Documentation:	140-page tutorial, 18-page Deskmate quick-reference guide, 80-page Deskmate tutorial, 78-page BASIC reference guide
Options:	Second 360K-byte disk drive ($300), 128K-byte memory expansion board (expandable to 256K bytes) ($300), 300-baud direct-connect modem ($180), TRS-80 touch pad ($60), serial interface board ($100)
Base List Price:	$1199
Typical System Price:	CM-2 color monitor, 256K bytes of RAM, two disk drives: $2350

reducing available memory for programming and data.

Third, and most interesting, the base model Tandy 1000 does not have a direct memory access (DMA) controller, which is a special-purpose processor that moves memory contents more quickly than the CPU can alone, resulting in faster processing. (The PCjr also lacks a DMA controller, but the IBM PC has one.)

Tandy engineers omitted the DMA controller from the base model 1000 because, in addition to increasing speed, a DMA controller also increases manufacturing costs and, ultimately, retail price. Besides, with only 128K bytes of RAM in the base model, the speed gains offered by a DMA controller would be slight. With more memory, however, the speed advantages of a DMA controller become significant, so the engineers opted to add a DMA controller to the memory expansion boards. In other words, a Tandy 1000 with only 128K bytes of RAM does not have a DMA controller, but one is added automatically when you expand the memory.

According to Tandy, this arrangement and other hardware enhancements built into the 1000 allow it to run about 50 percent faster than the PCjr and as much as 10 percent faster than the PC, depending on the software and the amount of memory installed.

Each memory expansion board fits into one of the Tandy 1000's three expansion slots; unused slots can accept any PC-compatible expansion boards up to 10 inches long. This size limitation rules out the use of full-size, 13-inch multifunction boards, but this is not a major handicap because many of the functions included on such boards—such as color graphics and a printer interface—are already included in the base model Tandy 1000.

In addition to RAM expansion boards, Tandy plans to offer a 300-baud, direct-connect internal modem ($180) and an RS-232 serial interface board ($100).

Compatibility

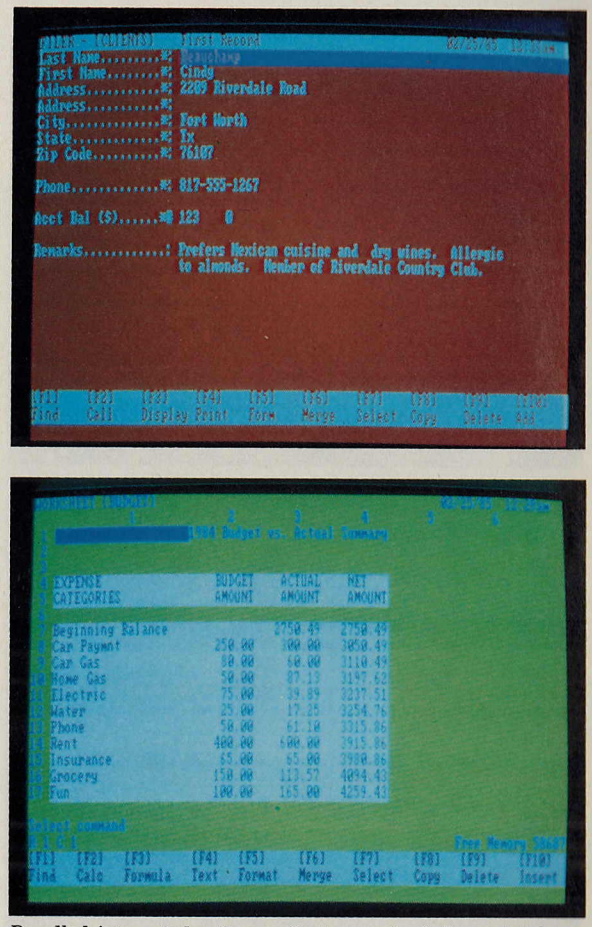
Like most PC-compatible systems, the Tandy 1000 comes with Microsoft's MS-DOS and GW-BASIC, giving it the ability to run hundreds of programs. And, as mentioned earlier, the Tandy 1000 is so similar to the PC that it can run many software packages written specifically for the PC.

But "similar" is not "identical," and the same caveats apply to the 1000 as apply to all IBM PC work-alikes: if a program uses proper entry points to the BIOS, it will run. But a program that "breaks the rules" and circumvents the BIOS (as with some complex copy-protection schemes, for example) may have problems.

Fortunately, because of the proliferation of IBM PC clones, most software publishers make their packages work as well on the compatibles as on the PC itself, so the issue of illegal function calls is becoming increasingly moot. In addition, Tandy plans to release custom versions of many popular PC-DOS programs (including 1-2-3, Microsoft Word, the PFS series, and others), which will further eliminate any serious worries about finding useful, compatible software to run on the 1000.

But for the record, the Tandy 1000 does have a few areas of potential incompatibility that are worth noting.

A more complicated difference lies in the fact that the Tandy 1000 has no configuration switches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State.....: Tx
Zip Code.....: 76107
Phone.....: 817-555-1267
Acct Bal ($).....: 123 0
Remarks.....: Prefers Mexican cuisine and dry wines. Allergic to almonds. Member of Riverdale Country Club.
Find Call Display Print Form Merge Select Copy Delete

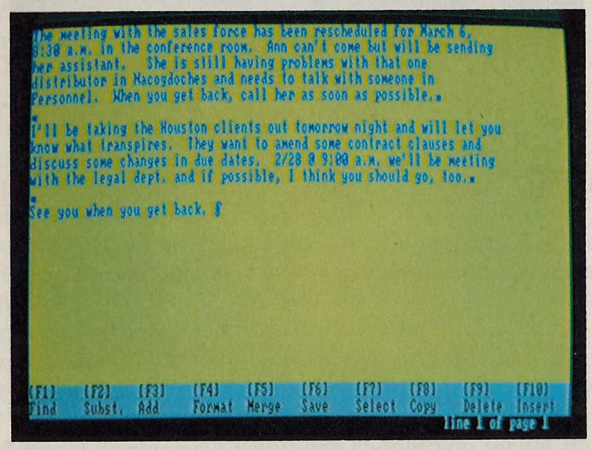
Bundled integrated software, Deskmate, includes a database manager (top) and electronic spreadsheet (bottom).

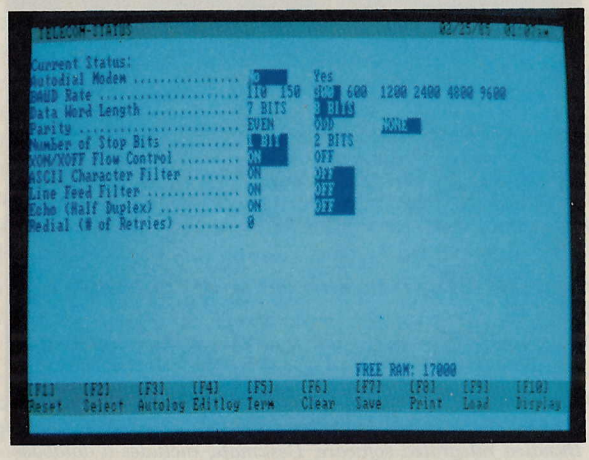
The 1000's keyboard, for example, is different from the IBM PC's. Some of the 1000's keys may behave differently when used with software specifically designed for the IBM PC. Function keys, for example, may not work at all or may produce unexpected results. (The alphabet and numeric keys are unaffected, however, and produce the same results on both machines.)

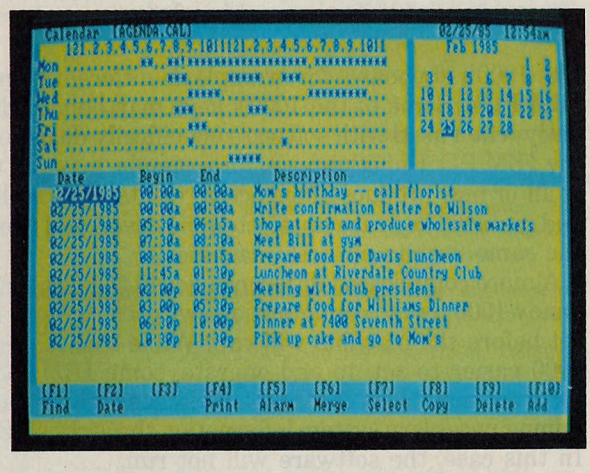
A more complicated difference lies in the fact that the Tandy 1000 has no configuration switches that you must set before the machine will run. While this makes the 1000 easier to set up and operate, some IBM-specific software may "look for" those switches rather than obtaining necessary system information through the BIOS. In this case, the software will not run.

Next, while the Tandy 1000 can display standard PC-like graphics and has the PCjr's display enhancements,

The Tandy 1000 is highly compatible and should run most software written for the IBM PC


The meeting with the sales force has been rescheduled for March 6,
8:30 a.m. in the conference room. Ann can't come but will be sending
her assistant. She is still having problems with that one
distributor in Nacogdoches and needs to talk with someone in
Personnel. When you get back, call her as soon as possible.
I'll be taking the Houston clients out tomorrow night and will let you
know what transpires. They want to amend some contract clauses and
discuss some changes in due dates. 2/28 @ 9:00 a.m. we'll be meeting
with the legal dept. and if possible, I think you should go, too.
See you when you get back. §
(F1) (F2) (F3) (F4) (F5) (F6) (F7) (F8) (F9) (F10)
Find Subst. Add Format Merge Save Select Copy Delete Insert
line 1 of page 1


Current Status:
Autodial Modem ..... Yes
BAUD Rate 110 150 300 600 1200 2400 4800 9600
Data Word Length ..... 7 BITS 8 BITS
Parity ..... EVEN ODD NONE
Number of Stop Bits ..... 1 BIT 2 BITS
XON/XOFF Flow Control ..... ON OFF
ASCII Character Filter ..... ON OFF
Line Feed Filter ..... ON OFF
Echo (Half Duplex) ..... ON OFF
Redial (# of Retries) 0
FREE RAM: 17000
(F1) (F2) (F3) (F4) (F5) (F6) (F7) (F8) (F9) (F10)
Reset Select Autolog Editlog Term Clear Save Print Load Display


Calendar [AGENDA.CAL]
Feb 1985
Mon
Tue
Wed
Thu
Fri
Sat
Sun
Date Begin End Description
02/25/1985 00:00a 00:00a Mom's birthday -- call florist
02/25/1985 00:00a 00:00a Write confirmation letter to Wilson
02/25/1985 05:30a 06:15a Shop at fish and produce wholesale markets
02/25/1985 07:30a 08:30a Meet Bill at gym
02/25/1985 08:30a 11:15a Prepare food for Davis luncheon
02/25/1985 11:45a 01:30p Luncheon at Riverdale Country Club
02/25/1985 02:00p 02:30p Meeting with Club president
02/25/1985 03:00p 05:30p Prepare food for Williams Dinner
02/25/1985 06:30p 10:00p Dinner at 7400 Seventh Street
02/25/1985 10:30p 11:30p Pick up cake and go to Mom's
(F1) (F2) (F3) (F4) (F5) (F6) (F7) (F8) (F9) (F10)
Find Date Print Alarm Merge Select Copy Delete Add

Other Deskmate applications include Text (a word processor), Telecom (telecommunications), and Calendar.

a program that accesses the graphics mode through a particular hardware port (instead of going through the BIOS) will not work. Differences in the video circuitry also may change the colors displayed by a software package; a background that might be red on a PCjr screen could be blue on the Tandy 1000, for example.

Two final potential trouble spots include timing and disk control. Software that depends on timing loops or delays may fail because of the speed differences mentioned earlier. Also, software that directly accesses the PC's disk controller will probably fail—although that compatibility is enhanced somewhat when a DMA controller is added via a memory expansion board.

But these are only potential trouble spots. The bottom line is that the Tandy 1000 is highly compatible and should run the vast majority of software written for the IBM PC.

Deskmate

One extremely useful software package that is certain to run on the Tandy 1000 is Deskmate, a powerful, easy-to-use integrated program that is included with the machine. Lots of the IBM compatibles come bundled with software, but Deskmate is different in that it was written specifically for the 1000. It actually consists of six major applications programs that operate through the same, friendly user interface. The applications include: Text (a word processor), Filer (a database), Worksheet (a spreadsheet), Calendar (an appointment scheduler and alarm), Telecom (a telecommunications driver), and Mail (an electronic-mail facility). Deskmate saves all its data as standard ASCII files, so each function can access the data generated by other functions.

Deskmate is a major product in itself—250K bytes of machine-language code that took a software team, which grew to include 17 Tandy programmers, more than a year to develop and that eventually will be offered for all Tandy business computers. The idea behind Deskmate is to equip all purchasers of Tandy 1000s with useful, powerful applications software they can run as soon as the computer comes out of the box. For some home and light business use, Deskmate may be the only software needed; it's that powerful. For other uses, Deskmate will serve as a thorough introduction to the six most used computer applications.

For ease of use, the program is designed to be largely self-explanatory: Deskmate is controlled by the function keys, and labels indicating what the function keys do always appear on the screen. What's more, the function keys operate consistently from application to application; that is, the same key does roughly the same thing in every application, so you have to learn what the keys do only once. In addition, you can summon a screenful of text (a "help screen") to explain any function in detail by pressing the F11 key, and you always can get back to Deskmate's opening screen by pressing F12. Although Deskmate is complex, this consistent use of the function keys makes it easy to learn.

When you run Deskmate, the opening screen (see pages 64 and 65) shows a calendar of the current month

QUARK ANNOUNCES

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*If you do not have a Duodisk, or use an Apple III, a special cable is available. See your dealer for details.

**Catalyst works on the Apple IIc, IIe and Apple III. It is not compatible with Macintosh.

Photography by Barbara Kasten

On AIMS/inquiry card 58

with the current day highlighted, a list of any appointments you previously entered for the day, the names of the six main applications, and any disk files you've created with the program.

You use the cursor keys to select whatever application you wish to run or whatever disk file you want to work on. Alternatively, you can use the function keys to change the date and time; rename any file on disk; display how much disk space is available; set the alarm function; place the 1000 in "host" mode, where it can be controlled by a remote machine via telephone and modem connection; assign a password to the system, making it difficult for anyone else to have access to your files; copy or delete files on disk; or change to another disk. The options sound confusing, but the logical, easy-to-read display, on-screen labels for the function keys, and the always-available help screens make it simple.

At any time, by pressing the Alt key and one of the function keys, you can access a number of subfunctions: Help calls up an explanatory screenful of text for the subfunctions; Calc lets you interrupt whatever application you're running (without losing your place) to use the computer as a four-function calculator; Alarm turns the audible alarm on or off, and displays the next appointment; Phone lets you auto-dial any of up to 79 telephone numbers, with up to three prefix codes for Sprint, MCI, or similar services; Print lets you set basic formatting instructions (margins, lines per page, etc.) for printing out hard copy; and Date lets you change the current date and time.

The Six Applications

Text, Deskmate's word processor, has most of the features found in other word processors, including Find, Print, Add/Replace, Format, Merge, Save, Select (a block of text), Copy, Substitute, Insert, and Delete. The main drawback of Text is that it cannot handle files larger than the available RAM, which means that long documents must be broken up into smaller sections and handled separately.

Worksheet is a simple but powerful spreadsheet with a 99-row by 99-column visual format (you use the cursor keys to move from cell to cell so you don't have to remember the cell's row and column number). Almost two dozen mathematical formulas are built into the program and can be called up by name. Two unusual features include a "floating-text" block that can be used to add an introduction, footnotes, or clarifications to the spreadsheet and a special "input prompt" feature that lets you design the spreadsheet to stop its calculations and ask you (on-screen) for new variables. You can add as many input prompts as you wish to a spreadsheet, making it extremely easy to develop complex, automated "what if" scenarios.

Filer is Deskmate's database manager and supports up to 21 fields of data. You can sort, search (using "equal," "greater," or "less than" criteria), format, delete, or add data, compress the stored information for maximum efficiency, or perform any of nine other functions. Because of the limited number of fields, Filer is useful mostly as an electronic index-card system, rather than a full-fledged database management system.

The *Telecom* telecommunications program allows you to connect to other computers or on-line databases via a modem and telephone lines. You can create auto-logon sequences to let the Tandy 1000 dial up another computer and automatically send your account numbers and password. When connected to a remote computer, you can store incoming data in RAM or on disk.

Calendar lets you build an electronic "tickler" file that automatically reminds you of appointments, birthdays, and other important events each time you run Deskmate. (They are listed on Deskmate's opening screen.) You can enter dates as much as a year in advance. If you choose, these events also can be used to trigger an audible alarm that will sound even while you're using another application.

Mail is an electronic mail function that normally is used while the computer is in "Host" mode and connected to another computer. You can, for example, call your 1000 from another computer and leave messages on disk for others in your home or office to read at their convenience. A password feature provides security.

Package Deal

Separately, either the Tandy 1000 or Deskmate would be worthy of serious consideration. Combined, they make a powerful, cost-effective package. Moreover, the Tandy 1000 offers substantial price and feature benefits over its biggest competitors—the IBM PC and PCjr.

On the surface, the PCjr's price of $999 makes it the better buy, but that price does not include a parallel printer adapter, a disk operating system, or BASIC (all of which are included with the 1000). Adding these necessary "options" to the PCjr inflates its price to $1238, while a 1000 with a serial interface (included on the PCjr) is $1299. However, even with these options, the PCjr lacks some of the 1000's features, the most important of which is speed; the 1000 is as much as 50 percent faster. Also consider the 1000's expansion capabilities using plug-in boards designed for the PC. The PCjr requires specially designed add-on modules and, even worse, needs an additional power supply to power a complete 640K-byte system.

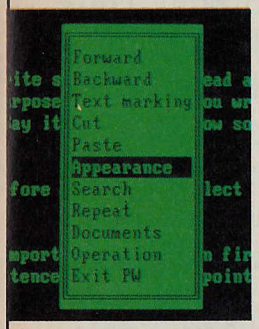
To compare the 1000 to a PC, the 1000 must be upgraded to 256K bytes of RAM—standard on a $1999 PC with one disk drive. Such an addition raises the 1000's price to $1499, but the PC requires a monochrome display/printer adapter, and a disk operating system, making its final price $2314, or $815 more.

Then there's Deskmate. It's hard to place a cash value on Deskmate, because it is included in the system price. However, it is fair to say that it takes the place of literally hundreds of dollars of separately purchased software. In fact, we believe that many people will make Deskmate their most-used program. Deskmate also lets you put your computer to work as soon as you get it out of the box—a capability neither the PC nor PCjr offers.

Clearly, the Tandy 1000 wins this battle in the computer marketing war. □

If a word processing program doesn't give you these 8 tools for better writing, it's not Perfect.™

1 Pop-up menus—so you can start writing better right away.



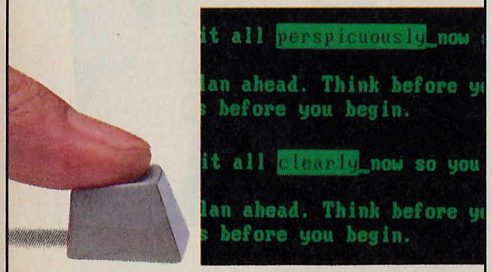
Perfect Writer™ pop-up menus use simple English language words. No complicated commands to memorize or slow you down.

2 Simple function and operation that keeps your mind on what you're writing.

You edit with the keys right under your fingertips. And menus appear right in the workspace with your document.

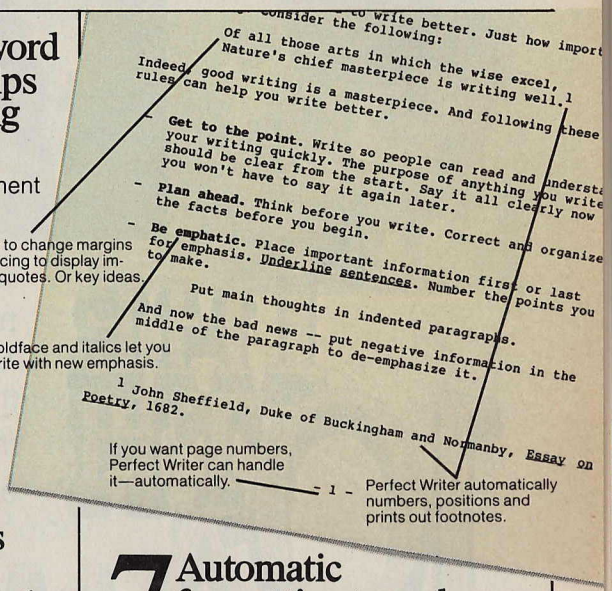
3 Powerful editing features at the touch of a single key.

You can move text. Search and replace. Add or delete words, sentences, even entire paragraphs.


it all perspicuously now
lan ahead. Think before y
before you begin.
it all clearly now so you
lan ahead. Think before y
before you begin.

4 A built-in 50,000 word dictionary that helps you prevent spelling mistakes.

Perfect Speller™ checks your document and points out spelling errors. Automatically.


to write better. Just how import
Consider the following:
Of all those arts in which the wise excel,
Nature's chief masterpiece is writing well.1
Indeed, good writing is a masterpiece. And following these rules can help you write better.
Get to the point. Write so people can read and understa your writing quickly. The purpose of anything you write should be clear from the start. Say it all clearly now you won't have to say it again later.
Plan ahead. Think before you write. Correct and organize the facts before you begin.
Be emphatic. Place important information first or last for emphasis. Underline sentences. Number the points you to make.
Put main thoughts in indented paragraphs.
And now the bad news -- put negative information in the middle of the paragraph to de-emphasize it.
1 John Sheffield, Duke of Buckingham and Normanby, Essay on Poetry, 1682.

It's easy to change margins and spacing to display important quotes. Or key ideas.

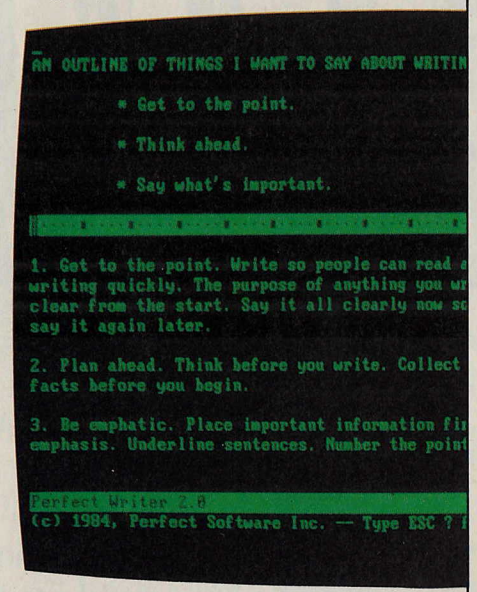
Boldface and italics let you write with new emphasis.

If you want page numbers, Perfect Writer can handle it—automatically. – 1 –

Perfect Writer automatically numbers, positions and prints out footnotes.

5 A built-in thesaurus to help you choose exactly the right word.

Perfect Thesaurus™ puts the best word for what you're writing, right at your fingertips.

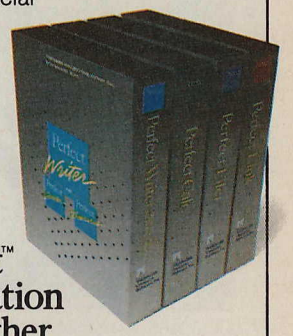

AN OUTLINE OF THINGS I WANT TO SAY ABOUT WRITIN
* Get to the point.
* Think ahead.
* Say what's important.
1. Get to the point. Write so people can read a writing quickly. The purpose of anything you wr clear from the start. Say it all clearly now s say it again later.
2. Plan ahead. Think before you write. Collect facts before you begin.
3. Be emphatic. Place important information fi emphasis. Underline sentences. Number the point
Perfect Writer 2.0
(c) 1984, Perfect Software Inc. -- Type ESC ?

6 Split-screen windows that help keep your thoughts organized—while you write.

You can use one window to jot down notes, key points or an outline—as you develop your text in the other window.

7 Automatic formatting to make your writing look even better on paper.

Perfect Writer works with most popular printers. And special appearance features make your document look like a masterpiece.



8 Perfect™ integration with other Perfect Software.

Perfect Writer is part of an integrated software family. There's also Perfect Calc™ spreadsheet. Perfect Filer™ information management. And Perfect Link™ telecommunications software. Each program uses common commands. So they work Perfect together—to help you work better.

Perfect™ The Perfect™ way to write better.

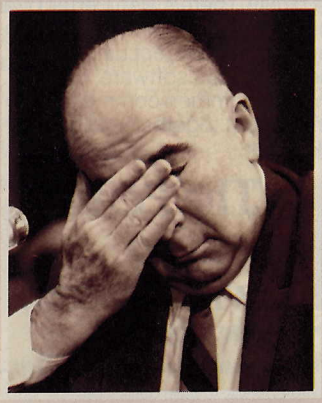
THORN EMI Computer Software, Inc.
3187 C Airway Avenue, Costa Mesa, CA 92626

Perfect™ Software is available for the IBM® PC, IBM PCjr, Apple® IIe and Apple IIc computers, as well as for computers that use MS™-DOS, CP/M® and CP/M® 86. Because of differences in computer architecture some features may not be available on every version. All Perfect Software programs are mouse compatible. IBM is a registered trademark of International Business Machines Corporation. Apple is a registered trademark of Apple Computer Corporation. MS-DOS is a registered trademark of Microsoft Corporation. CP/M is a registered trademark of Digital Research Corporation.

JANUARY 1975

The FBI was looking for Patty Hearst. *Saturday Night Live* was in its first year. Jerry Brown took over from Ronald Reagan as governor of California. Elvis Presley spent his fortieth birthday in his bedroom, contemplating his great weight and age. Mitchell, Haldeman, and Ehrlichman were convicted for their roles in Watergate. The 55-mile-per-hour speed limit became permanent. The Vietnam War staggered toward its end, with the Thieu government facing the real meaning of "Vietnamization." *The Bermuda Triangle* reposed on the best-seller list, and movies like *The God-father, Part II* and *The Towering Inferno* were drawing crowds. And the first personal computer, the Altair, was announced.

THE 10TH ANNIVERSARY OF THE PERSONAL COMPUTER

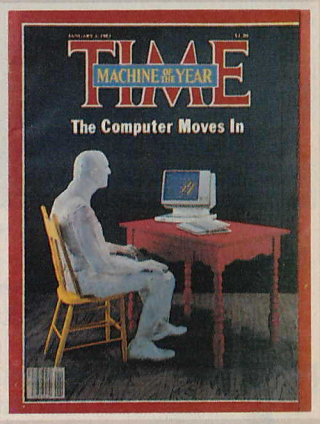


The machine went almost unnoticed. Its full capacities could not be exploited at first, and public consciousness of it went slowly from ignorance to polite skepticism to attentive curiosity. Though clever programmers

Photographs: Hearst and Mitchell (top and bottom left) UPI-Bettmann; Presley (bottom right) Globe Photos. Title design by Dennis Ortiz-Lopez

had it running games almost at once, serious uses took more time to devise. The first word-processing program, Electric Pencil, appeared in 1977, and the first financial spreadsheet, Visicalc, in 1979. Such practical applications spurred hardware sales, and by 1981 Dick Cavett was munching apples on national TV ads. The first portable computer came out in 1981, and the same year IBM burnished perceptions of the field by introducing its Personal Computer. A computer was *Time* magazine's "Man of the Year" for 1982. By 1983, people were craving to become "computer literate."

This month marks the tenth anniversary of the Altair. From its inconspicuous beginnings in an Albuquerque shopping center, the personal computer has conquered the world. Millions of microcomputers now exist in offices, schools, and homes, and they are transforming our society and even the way we think about ourselves. And yet the machine is still far from achieving its full potential.



At this point in the midst of a remarkable technological revolution, we pause to pull back a bit and take a wider look at what was, is, and perhaps will be.

—Paul Freiberger

Paul Freiberger is a West Coast editor of *Popular Computing.*

Photographs: Saigon evacuation, Haldeman, and Ehrlichman (top, middle, and bottom) UPI-Bettman

by Paul Freiberger

ED ROBERTS: The Father of the Personal Computer

Ten years ago an Albuquerque engineer trying to save his struggling company introduced an untested product with no existing market. The machine sold well and his business skyrocketed. In many ways, it has changed the way we work and play. If the world automatically honored its benefactors, we would all know that Ed Roberts was the inventor of the Altair, the first personal computer.

Seven years ago, Roberts retired from the personal computer industry to become a gentleman farmer. Today, he resides near Macon, Georgia, in a town so small it doesn't even appear on gas company road maps. But he doesn't just sit on the back porch drinking mint juleps and watching the heat. He attends medical school and works long hours at a lab bench on a handheld, computerized EKG, a product that he hopes will be even more significant than the microcomputer.

If Roberts had stayed in the personal computer industry, settled closer to Silicon Valley, or even given more interviews, he might have greater renown today. But he has preferred to pursue his own goals. "I have a rule of never looking back, of not spending a lot of time dwelling on the past," he says, in a relaxed, powerful voice. But though Roberts doesn't lose sleep over his lack of recognition, it understandably rankles a bit. And he welcomes the opportunity to remind us what the Altair was. It was the first personal computer. He designed it, manufactured it, and popularized it, and it has been only one phase of his multifaceted career.

The Seeds of an Idea

Roberts grew up in Miami, Florida, where he found high school tedious. "I actually failed algebra in high school," he says. But he also received a Heart Association fellowship and got work with a veterinarian for whom he performed over 200 open-heart surgeries on dogs. At the same time the budding doctor showed signs of the talent that would lead him to the Altair. When 16 or 17, he designed "the first computer I ever built," a device with relays and stepping switches to control a valve on a heart-lung machine.

Illustration by Steve Carver

Roberts had hoped to study pre-med in college, but the demands of supporting a family caused him to enlist in the Air Force, which offered him an education for free. With a bachelor's in electrical engineering from Oklahoma State University, he was soon working in the laser division of the Air Force weapons lab in Albuquerque, where he met Forrest Mims.

Roberts and Mims became close friends and later business associates. Roberts watched his friend launch his career as a technical writer and also helped him launch model rockets. Mims loved the gadgets. And when *Model Rocketry* magazine published one of Mims's articles about light flashers for model rockets, Roberts was intrigued.

"Do you think people would actually pay money for these light flashers?" Roberts asked. They would, Mims thought. The two of them began planning a company. In August 1969, they had the first of a series of meetings in Roberts's kitchen with a couple of colleagues from the Air Force lab. Roberts dominated the group with his personality and strong opinions. "He's got charisma," Mims says. Roberts's friends also believed he possessed a Midas touch and they wanted to join him. The group elected him president and set out to name their outfit. Since the business plan called for them to develop model rocketry equipment and advanced research in the field was taking place at MIT, they decided to call the company MITS, for Micro Instrumentation Telemetry Systems. "Ed didn't like the name," Mims recalls. "He said people would call us *mits*. I said, 'No, Ed, they call MIT, M-I-T; they'll call us M-I-T-S.' "

Within a week the company's founders were calling themselves *mits*. They began selling several products for model rocketry hobbyists. Forrest Mims's writing career was taking off and would prove a spectacular boon to MITS. Mims had met Leslie Solomon, technical editor for *Popular Electronics*, a magazine that depended on small, inventive companies to generate articles for its readers, primarily electronics hobbyists. Solomon visited Albuquerque, where he met Ed Roberts, and he brought word back to his New York-based magazine of a company with promise.

But telemetry devices didn't set the market ablaze and Roberts decided to change the company's direction. Change is good every so often, he says, though he also admits that his penchant for altering course amounts to "a definite character flaw."

"I've always had grandiose schemes," he says. "But I think I've been able to discipline myself to deal with real-world situations as well, which is a problem with a lot of people. They have all sorts of really fantastic ideas and they're never able to discipline themselves and realize that you can't, solo, go to the moon."

Roberts decided that MITS would move into the calculator business. His partners balked. What about the original business plan? they asked. But the original business plan no longer interested him, technologically or commercially, and he was determined to take charge. "You've got to be running the show or you're stifled," he says. He bought his friends' shares of the company for $900 in cash and equipment.

Back in control, Roberts walked into disaster. He built an LSI (large-scale integration) kit calculator that appeared on the cover of *Popular Electronics* in 1971. It cost $169 while comparable calculators were selling for close to $500. The design was clever and could accommodate an add-on programming module. He likens the programmable calculator to a computer, a fact that he claims has "gotten lost in the noise level."

A Calculated Risk

At first the calculator did well. Mims recalls that Roberts was delighted and that his household was filling up with such amenities as a color television and microwave oven. But other companies soon entered the calculator business, big firms like Texas Instruments, which outdistanced MITS technologically while slashing the price. By 1974, calculators cost less than $30.

Roberts isn't one to complain when times are tough. But his somber mood and the canceled nighttime production lines told Forrest Mims that MITS was faltering. In fact, it barely survived the calculator crash. "We damn near lost our butt," says Roberts. The company was in debt, and the bank was threatening to close him down. He lay awake at night blaming himself and grasping for a new idea.

He thought about computers. They had fascinated him ever since he built the valve control system in his teens. He ties them in with wealth and power. "Often it's not how much gold you own or how many diamonds you have. It's how many people you control or how many million lives you control. You look at a computer. Even an early Altair would convert a 20 by 20 matrix—that's what sticks in my mind—in about two minutes. It takes a mathematician with a slide rule about 80 years to do the same conversion. So you end up giving the average person enormous power. Twenty years ago, if you had that kind of power, you could rule the world almost."

Roberts was intrigued. But he was no more confident about the sales of a kit computer than he had been about rocket flashers. He went ahead with the design anyway. Like the hobbyists who would buy his product, he had gotten into computer design for the thrill of the work itself. "It certainly wasn't done with the idea that it would save MITS. It was much more a labor of love."

At about the same time *Popular Electronics* editor Art Salsberg decided *PE* should publish an article on a kit computer. He and technical editor Les Solomon had received several submissions but few showed promise. Roberts told them he had designed a computer based on a new chip, the Intel 8080. He recalls that Salsberg told him that the computer had to be a minicomputer (the term microcomputer was not yet coined) and sell for less than $400. The magazine became interested in Roberts's project.

The design was not the major problem. Solvency was. Roberts needed a loan of $65,000 in order to proceed.

Paul Freiberger is a West Coast editor of *Popular Computing* and coauthor of *Fire in the Valley: The Making of the Personal Computer* (Osborne/McGraw-Hill, 1984).

"I really expected us to get shut down," says Roberts. He could sell 800 computers during the next year, he told the president of Albuquerque's Fidelity National Bank. "It was good for chuckles," Roberts says. "But they allowed that if we could sell a hundred of them it would help. I wasn't trying to con them. I thought maybe we could get to 2000 in a year."

No one knew what the market for an inexpensive microcomputer might be. Market surveys in 1975 were about as useful as they are today. Roberts asked his friends if such a machine would interest them; few said it would. Roberts was discouraged.

But he was learning to live with this kind of uncertainty. He flew to New York to discuss the Altair story with Art Salsberg and Les Solomon. The editors liked and respected Roberts. But they worried that a kit computer story might be a little ahead of its time. Salsberg asked him some tough questions. The article was crucial for Roberts, whose hopes rested in the market that a *Popular Electronics* cover story could attract.

The story came out in January 1975. Entitled "PROJECT BREAKTHROUGH! World's First Minicomputer Kit to Rival Commercial Models. . . ALTAIR 8800," it was the shot heard round the world for the many who were waiting for just such a machine.

Off and Running

The original Altair was a box with switches and lights on the front; inside it had a microprocessor board and 256 bytes of memory—¼K. It sold for $397, just $30 more than Intel normally charged for an 8080 chip by itself. Hobbyists stampeded MITS. Some flew in from all parts of the country. Others sent checks in the mail and waited. Roberts was stunned. His Altair had ignited a wildfire. MITS began to grow.

Roberts had been running a company that was close to foundering, and he hadn't been able to plan ahead. But when his machine turned into an overnight success, he set out to meet the demand. He ordered his company to delay the development of add-ons such as extra memory, terminals, and keyboards.

If Roberts had merely developed and sold the first personal computer, it would have been significant enough. In fact, he pioneered an entire industry on many fronts. First was the internal design of the computer itself. Roberts wanted it expandable. "We made a commitment to do a system design," he says. "Before we even talked to *Popular Electronics* we had cursory interfaces for disks, tape drives, and a couple of different types of printers."

The Altair's internal structure, which many companies later imitated and improved upon, was called the Altair bus and later the S-100 bus. Microcomputer makers competing with MITS hardly wanted to name their design after their biggest rival. They tried and were able to popularize the name S-100.

MITS also encouraged user's groups. Roberts filled a motor home—"The Blue Goose"—with MITS employees and sent it roving about the nation. This road show, which included a young Harvard undergraduate and MITS software designer named Bill Gates, stopped and talked to micro owners and potential owners. A year after the Altair announcement, MITS began planning the first microcomputer show: the World Altair Computer Conference. The fair was a tremendous success, attended even by competitors, such as Processor Technology, which displayed its wares outside the hall itself.

Software Wars

Applications software for the hobbyist was nonexistent in 1975, but Roberts knew he needed a programming language. He received several offers of such software, one from Bill Gates and Gates's friend, Paul Allen. The two youths had been working on minicomputers since they were teenagers; the Altair excited them.

Gates and Allen began work on a BASIC for the Altair and soon moved to Albuquerque and took charge of the MITS software department. The relationship between Gates and Roberts was not always serene. The two contrasted markedly. Roberts was an imposing figure, tall and husky, and he spoke his mind. Gates was a brash kid, raised in a well-to-do Seattle family. He looked young and innocent, and he used this appearance to his advantage. As Roberts reminisces, the name of Gates comes up again and again in highly unflattering contexts. "I was the first person in his whole life who ever told him no," Roberts says. He also wishes he had fired Gates. "I made up all kinds of excuses about it. The guy was young, bright, didn't know what he was doing, and all that kind of stuff. But I think he certainly had a detrimental effect on MITS."

Much of this animosity stems from ownership of the BASIC that Gates and Allen developed. Gates and Allen claimed that they should retain rights to the BASIC after they left MITS. An arbitrator ruled in their favor and they moved to Bellevue, Washington, to build their company, Microsoft. Roberts says the arbitrator's decision was a fluke.

MITS did $1 million in sales in 1975 and tripled that in 1976. "Our market was bigger than our capacity to expand," says Roberts. "People that were hired as floor sweepers were promoted to middle management."

The words MITS and Altair became synonymous with personal computing, much as Apple and IBM are today. Other companies began to design and sell the add-ons that Roberts lacked the time to make. Soon still others dared build and market their own personal computers. But MITS dominated the industry for two years. When Ed Roberts finally decided to sell the company in May 1977 to Pertec, a minicomputer and mainframe firm, MITS was doing $20 million in business annually.

Roberts had planned to continue working at MITS under its new owner. He believed a big firm would automate the company's assembly lines. But Pertec didn't understand what it had. "They brought in people who had no knowledge of what our basic business was," says Roberts. Long-time MITS employees spoke of Pertec as "two-bit managers in three-piece suits."

In late 1977, Roberts left the company suffering an apparent case of burnout. "I wanted to be in a place

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where the only decision I made was whether I turned right or left when I got to the end of a road," he says. "You make hundreds of decisions every day, a lot of which really impact personal computing, and I was really looking for something that didn't have that pressure. It took three months before I realized you can't really go backwards." Other companies replaced MITS as the most influential in the industry and soon the pioneering firm faded completely.

Changing Course

Roberts bought an 1100-acre farm in Georgia, where he grew corn, wheat, rye, and soybeans, and raised hogs and cattle. "I did enjoy farming, but I realized I'm not smart enough to be a farmer," he says, referring to the difficulties of commercial farming. Eventually he decided to rent out his land.

Roberts is proud of the Altair ("the best buy that's ever occurred in electronics, period") and irritated by the Gates affair, but in general does not spend his time dwelling on the past. Sometimes, as when he sees the fortunes made by the founders of Apple, he thinks that perhaps he should not have left the field.

The changes in the industry since he left it are not all to his liking, however. He sees large corporations limiting innovation. "If you allow one company to dominate any industry it's got to lead to stagnation."

So now Roberts is going forward in medicine, the profession he meant to pursue when he was in high school. He is president and part owner of Georgia Medical Electronics, whose headquarters is just down the road from his farm. Whenever he can spare the time from medical school, he repairs to his roomy office with its large desk. In the adjacent lab, his son David and other employees work on his projects.

His principal product thus far is the handheld EKG, a device that can check heartbeats almost instantly. "You just touch it to the chest," Robert says. His battery-powered device yields quick data on whether a patient has serious arrhythmia or other problems. It uses an NSC 800 processor and stores 60 seconds of information digitally in memory. Ultimately, Roberts foresees a pocket-size EKG, "where you can see a patient in the emergency room and do an immediate screen."

He is also developing a stethoscope with display and is working toward an instrument that will combine the features of both a stethoscope and an EKG. "No one has ever done that before in pocket-size," he says. "And this product has some interesting implications. A stethoscope sells for $150 retail. We're talking about an instrument that does that and an EKG and cardiophonograph for about $500." Moreover, he thinks physicians will respond well to the technology itself. "Ten percent of our original Altair customers were M.D.s," he says.

And Roberts is a natural inventor. He may not live in Silicon Valley or on Route 128, but they are different places today because of him. "I consider engineering the ultimate art form," he says. If you ever have need for an emergency EKG, you may have another reason to thank this plainspoken artist of the circuit board. □

MY FIRST PERSONAL COMPUTER

IVAN BERGER *is a technical editor at* Audio *magazine. This piece is adapted from Berger's contribution to* Digital Deli, *an anthology from Workman Press, (1984).*

In January 1975, *Popular Electronics* ran an article on how to build a home computer called the Altair. I read that article and began immediately thirsting—lusting—for a computer of my own, both to learn about computing (which I did, the hard way) and to accomplish wonderful and useful things with it. By late '76 I had my Altair.

And what did I accomplish with my wonderful machine? Nothing, or darn close to it. I was ready for computers, but the computers of those days weren't ready for people.

Unwrapped, my Altair turned out to be just a box. The switches on its front panel were its only input device. The red lights on the panel were its output, flickering on and off in patterns that showed what you had input with the switches and what the computer did as a result. The lights operated at the same simple-minded level as the computer itself, in binary numbers rather than decimal. Binary numbers are built up of 1s and 0s; to enter a 1 you raised a switch, to enter a 0 you lowered it. The corresponding lights glowed for each 1 and darkened for each 0.

Nothing could be simpler—for the machine. For humans, it was excruciatingly complex, though many mastered it. Programming a simple, one-byte instruction (such as "Stop") took eight switch settings. Luckily, a friend who owned a similar machine initiated me into the mysterious world beyond binary. On his advice, I bought a terminal with a keyboard and screen, rigged the thing up to the computer, plugged in an input/output board, and added a memory board to hold the programs he said I needed.

With those programs, typing in the instruction "jump to memory location 01D5 if the value in the A register isn't 0" became as simple as C2 D5 01 rather than a switch sequence of 11000010 1101010 00000001. But writing programs in tiny steps of arbitrary letters and numbers was still infuriatingly slow. What I needed, said my friend, was a "high-level" language: BASIC.

BASIC was available from Altair—on punched paper tape, which required a special paper-tape reader. Fortunately, my friend's terminal was a Teletype printer, which could also read and punch such tapes. I ordered BASIC, he read it into his machine, then re-recorded it from his machine onto a tape cassette. I had a cassette recorder and added another board to translate between computer and cassette deck. The only remaining problem was that my best version of BASIC took up all of the computer's 16K bytes of RAM, and to solve that I had to plug in still more memory boards, eventually raising it to 56K.

Now I could start writing BASIC programs and save them on cassette tape to reload when I wanted to rerun them. I was cookin', though still at the scrambled eggs stage.

But by then, the next generation of computers was upon us: computers like the TRS-80 Model I, the Commodore PET, and the Apple II. These had memory, cassette connections, keyboards and (except for the Apple) screens built in. Not only that, but they had BASIC built in so you could start programming in BASIC instantly—no waits while you loaded it in from a tape. They were marvelous, so marvelous they spelled the end of the Altair. □

by Dan McNeill

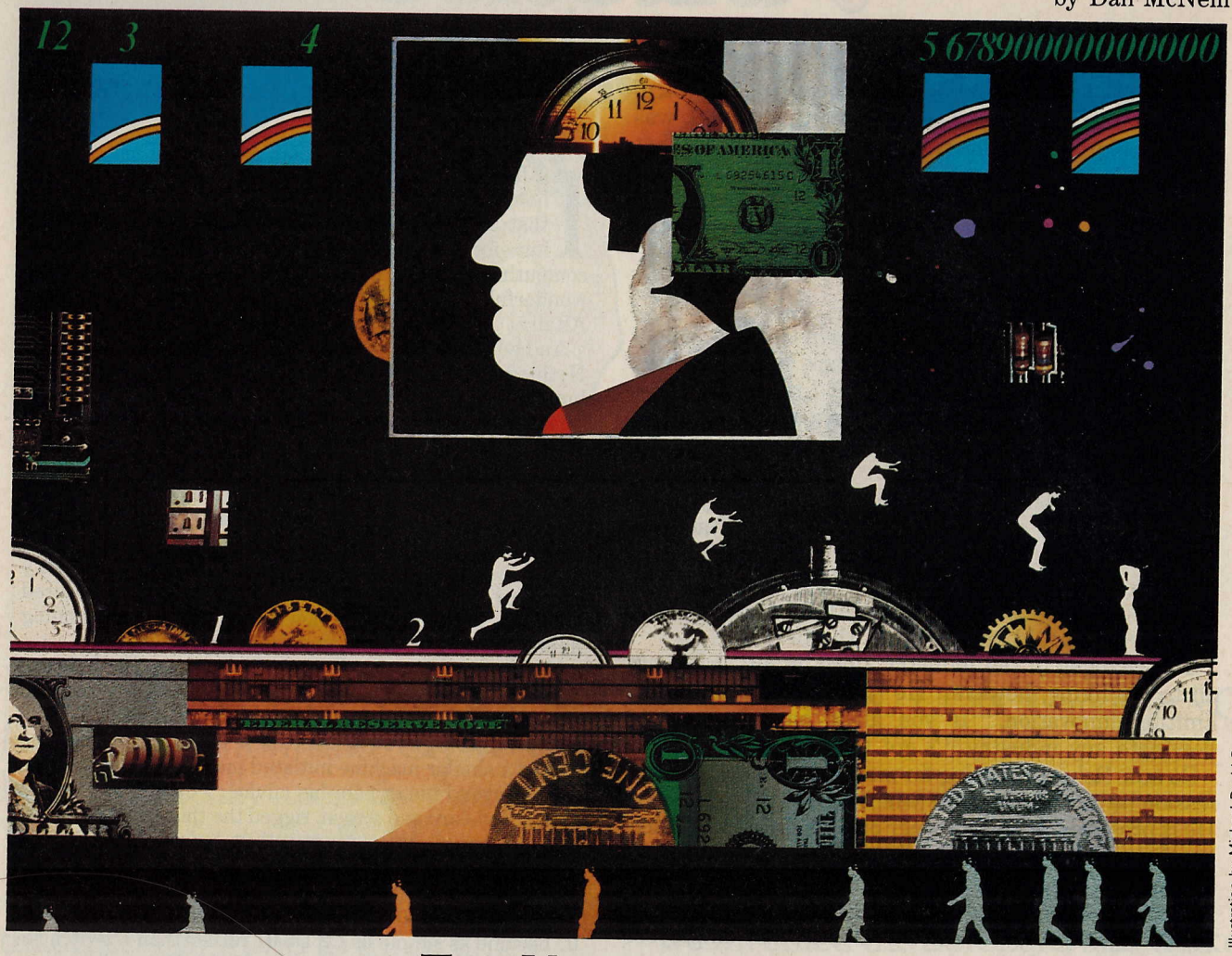

Illustration by Michael David Brown

TEN YEARS AFTER: The Micro's Imprint on Society

We are different today. We live with the personal computer, a modern marvel, a cool genie beyond the imagination of the *Thousand and One Nights*. It magnifies our powers and exalts us as individuals and at the same time fascinates us as a dim mirror of ourselves. After ten years, it has touched us economically, socially, and psychologically, in ways as varied as the facets of the device itself.

Its effects have truly been myriad. Some, like the transformation of the office, are already obvious. It heightens productivity and, sometimes, axes jobs. Other effects are more uncertain. It is unclear, for instance, how the machine will influence employment patterns, mail delivery, or classroom learning. In still other areas, the computer exerts subtle but powerful effects, like the plant that grows in the crack of a rock and eventually splits it in half. For example, the computer is affecting our children's development and even our notions of the way we think, with implications that are scarcely calculable.

Not every spin-off of the personal computer will be charming. Though its dramatic virtues have created a crop of electroprophets who paint balmy pictures of the bliss we can expect in five or ten years, such visions of paradise around the bend are simply escapist and generate sharp dystopian correctives like Orwell's *1984*. The truth is never all golden or gray, but always more interesting and complex than either.

The New Productivity

The personal computer has enhanced individual productivity. One person can now do more per unit of time and often undertake tasks that would otherwise be too burdensome. Heightened productivity is the stuff commercial dreams are made of.

The machine thus bestows a form of power. For instance, Palo Alto attorney David Alexander notes that it formerly would have taken hours or days to draw up, say, a contract for a limited partnership. He would dictate the document, then send it into a prolonged cycle of typing and correction. Now he has a form on his com-

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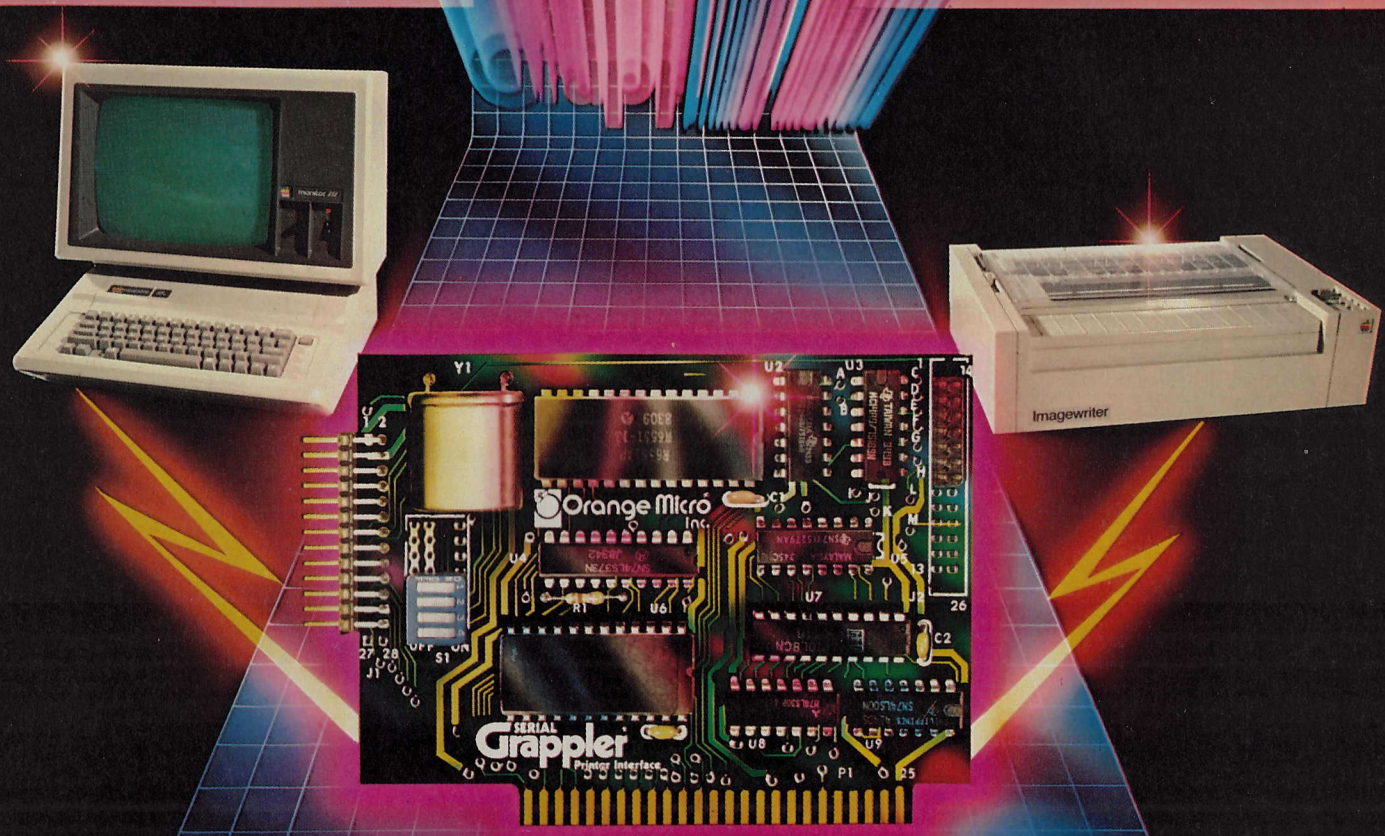

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puter. He sits down at the computer and simply adjusts the form to fit the client's needs, and the client pays for fewer hours. "It takes a fraction of the time," he says. "I couldn't conceive of doing law without it." Likewise, Gene Beisman, an independent construction consultant in Pacific Palisades, California, expedites his work with word processing, spreadsheets, databases, and the capacity to communicate with large computers at places like Boeing and McDonnell Douglas. "We're doing things with the personal computer today that a few years ago you could do only on a mainframe," he says. "That makes a big difference."

In addition to aiding lawyers and engineers, the personal computer is giving new power to professionals in journalism, bookkeeping, publishing, medicine, business, and many other fields. Professors at Princeton and Dartmouth are using computers to scan Virgil, Shakespeare, and the Bible for patterns of word usage. Bankers are using micros to make financial projections, plan tax strategy, analyze consumer credit and customer profitability, manage deposit accounts, collect loan defaults, and perform numerous other functions. It is, in fact, hard to think of any invention that has altered as many enterprises as fast as the personal computer.

How is this productivity revolution affecting society? According to UCLA economist Daniel Friedman, it cuts the cost of many services and increases output. In the short run, it will raise profits for businesses that computerize, since they will have an edge over competitors who don't. Eventually, however, market pressures will compel nearly universal computer use, and the advantage will disappear. Overall, Friedman says, it is "reasonably safe" to conclude that the personal computer is boosting the gross national product and thus our total wealth.

Much of this increase stems from lower labor costs. In *The Micro Millennium* (Viking, 1980), Christopher Evans predicted that the personal computer would bring the work week down to 28 hours by the mid-80s—that is, by now—and under 20 by the 1990s. All of us would enter Leisure Universe. The logic glowed: increased productivity cuts the time we need to spend on our jobs, and therefore we actually will spend less time on them. But of course employees do not run the workplace, and few of us work 28 hours a week. Also, if one person can now do the work of two, companies can save money by retaining the one and laying off the other. The personal computer, like the robot and much previous innovative technology, creates unemployment.

There is a difference, however. While in the past machines have generally replaced unskilled workers, micro software might lay off professionals. Stanford professor of education Henry Levin says, "Drafters may be a threatened species. And engineers are expensive, so if you can displace them, it's only logical to do so." Moreover, the advent of such items as natural languages and mice, which reduce user requirements, actually endangers in-house programmers (though not, of course,

Dan McNeill is a San Francisco author whose Smith-Corona is now very dusty.

MY FIRST PERSONAL COMPUTER

DOUG CLAPP *has written about the computer industry for several years and is the author of* Macintosh! Complete *from Softalk, North Hollywood, CA (1984).*

My first computer was one I never owned. It was a Heathkit, an "analog" computer. What year was it? Oh, maybe the early '70s—it was pre-Altair and pre-IMSAI and pretty much pre-everything else. It drove me crazy. It was the size of a breadbox. The front was loaded with little chrome toggle switches, the kind found on dashboards of expensive Italian sports cars. It had no terminal, of course, and no software. I'd never heard the word "software," so that didn't bother me.

What bothered me was this: Why did I want the thing? And I did want it. Boy, did I want it. But why? What was it good for? What would I do with it? I had no idea, which, if anything, made me want it more. What I wanted to do, I guess, was to . . . well, let's say I wanted to "dork around" with it.

I wanted to play with it—the way a child will play with an oddly shaped twig or a gum wrapper found on the street. I wanted to throw those toggle switches. I wanted to see those little red lights on the front blink on and off. I wanted to make it do something "neat."

But I was broke and it was an expensive toy, so I didn't buy (maybe someday. . .). What happened next were KIMS and Jupiter Aces and S-100 kits and, finally, Apples and TRS-80 Model Is.

I bought a TRS-80. I loved it like you love the first person you ever fall head over heels for. I hated it like you hate the first person who stomps on your yearning heart. It was, I think, 1978. My wife didn't see me much that year. I had discovered Microsoft BASIC.

These days, Bill Gates thinks of me as the guy who "rips everybody up." Maybe so, but Gates is safe from me. His firm's BASIC (and, if you look deep enough, it's still his BASIC) entranced me, completely.

Microsoft BASIC was, truly, my first computer. The TRS-80 was just an ugly, clunky, barely functioning shell that enclosed the language that fired my imagination. I'll admit it, I didn't understand BASIC. Oh, I understood some of it, sure, but pointers and nested loops and functions? You've got to be kidding! Even strings gave me trouble, to start with.

I was goofing off, really. I was trying, somewhat successfully, to earn a living as a freelance fiction writer. The TRS-80, in theory, was a "writing tool," not a plaything. But I had variable memory addresses to worry about; making a living could go hang for awhile.

And it did. Like all good hobbies—like the hobbies you love—playing with BASIC got completely out of hand. And I loved every minute of it. Looking back, it seems that one day I was in the basement, seeing what happened when I put a comma before PRINT, and the next day—the very next day—an editor friend calls and asks for a "piece on your first computer."

What happened there anyway? What was going on? It beats me. There's only one way to explain it, I guess. I'll say the line I say to everyone. I say this line a lot. All my friends have heard it over and over again. People who barely know me hear it all the time. Sometimes I think it's the only line I've got.

Here it is: I've never had so much fun. □

← On AIMS/inquiry card 52

MY FIRST PERSONAL COMPUTER

ALAN COOPER, *32, started one of the very first software companies in 1976. Today, he is still creating complex and powerful programs that, in his words, "only a mother could love."*

In 1976 my partner and I began our microcomputer software business. We spent several months searching for the best computer to sell with the software. At the time, the two most viable choices were the Altair 8800 and the IMSAI 8080, a knockoff of the Altair made by IMSAI of San Leandro, California.

Unfortunately, although these were the first practical microcomputers, the Altair, and to a lesser extent the IMSAI, suffered from several major problems. These included—five years before the IBM PC—a lack of reliability, availability, and serviceability. But the IMSAI sure looked good: Its aluminum chassis had a handsome Plexiglas front panel, with numerous elephantine lights and the sexiest row of alternating bright red and sky-blue toggle switches for *directly accessing memory!* In contrast the unglamorous Altair had clumsy minitoggles on a cheap-looking silkscreened aluminum front panel.

In our quest for the right computer we sought out my friend, author Mitchell Waite, who at that time was doing freelance documentation for IMSAI. In his office on his Marin County houseboat, he had not only a fully configured IMSAI (it bulged with 32K of static RAM), but a pair of IMSAI disk drives and a printer as well! It was the most sophisticated micro installation we had ever seen.

My partner and I were impressed, to say the least. It was exactly what we had imagined a turnkey business microcomputer would look like. Interestingly, Mitchell himself was less than overwhelmed by the IMSAI—he didn't even bother to turn it on for us. He had this other electronic gizmo—he called it (generously, I thought) a computer. But it was really nothing more than a single green circuit board covered with fine blue wires, with a couple of test leads running to a small color TV perched on a stack of programming reference books on the floor.

Mitch enthusiastically touted this abominable-looking electrician's nightmare. He said it was an Apple and claimed it was superior to the IMSAI in many ways. After he adjusted a couple of on-board jumpers, we played the game Breakout on it for quite awhile.

After our visit, my partner and I bought the first of our many microcomputers: an IMSAI 8080. We had quite a chuckle over Mitch's preference for the naked little circuit board over the businesslike front panel of the IMSAI. We used our big machine, and its successors, to develop countless lines of program code, all strictly business: accounting, spreadsheets, word processing.

Less than a year later, Apple introduced the circuit board's big brother, the Apple II "personal computer," and the handwriting was on the wall for the makers of mere "microcomputers." During that same year, 1977, MITS was purchased and its Altair line was quietly buried. In 1979, IMSAI went bankrupt.

About three months ago I bought my first Apple product: a shiny new Mac. Its plastic case is the same familiar beige as the old Apple II, but vastly different from Mitch's Apple wobbling loose among the spare parts on his desktop. Now, when acquaintances ask me when I got my first personal computer, they give me quizzical looks when I answer: "A few months ago." □

software authors). Six years ago the typical office had a COBOL programmer. Today, applications software is taking over for the programmer. "It's already happening," Levin says.

Levin also challenges the thesis that the growth of high tech will compensate with new jobs of a loftier nature. Using data from the Bureau of Labor Statistics and other sources, he concludes that high-tech occupations will provide only 7 percent of the new jobs created between 1978 and 1990. The United States will need four times as many new janitors (600,000) as computer systems analysts (150,000). Moreover, though high tech is growing very fast, only about 15 percent of its new employees will need two years or more of college. The rest will hold more menial support jobs. "The personal computer is not creating more fields and more occupations. That's the important point," Levin says. And as professional work becomes more concentrated, other jobs become more routine, with fewer opportunities for individual judgment and imagination.

However, technological unemployment has historically been transitory, and economist Friedman notes that a major innovation like the personal computer can create economic bloom further down the line, beyond the circle illuminated by statistics. "Wealth has to go somewhere," he says. It could lead to more investment and employment in completely unrelated areas, such as entertainment, travel, or restaurants. Moreover, the final consequences could be far from dire. "In the short term, there may be some dramatic winners and some dramatic losers," he says. "But when the dust settles, the standard economic theory suggests that wages will be higher, not lower."

Economic Implications

Electronic mail transmits work products almost instantaneously, unlike the fastest physical mail services, which boast about 24-hour delivery. Electronic mail has thus exacerbated many productivity issues and created new ones.

For example, it enables payment of bills from the home: home banking. Press a few keys and the bank instantly debits your account and credits, say, Exxon's account. The consumer benefits because it's easy and postage-free. The bank realizes enormous savings in check handling, envelopes, and stamps. According to Robert Lipp, president of Chemical Bank, home banking could lower the cost of processing the average bill payment from the current $1.02 to $.35, saving Chemical millions per year.

Home banking also eliminates the time lag between when you mail a check and your creditor cashes it, and hence gives the money to large companies instead of you during this period. You will lose a sometimes serendipitous buffer for cash-flow problems, and the large corporations will have more money to invest and to finance ads convincing you that this arrangement is great. Home banking is uncommon so far—perhaps because banks have charged extra for this service without convincing customers of its value. Yet advocates predict it will be

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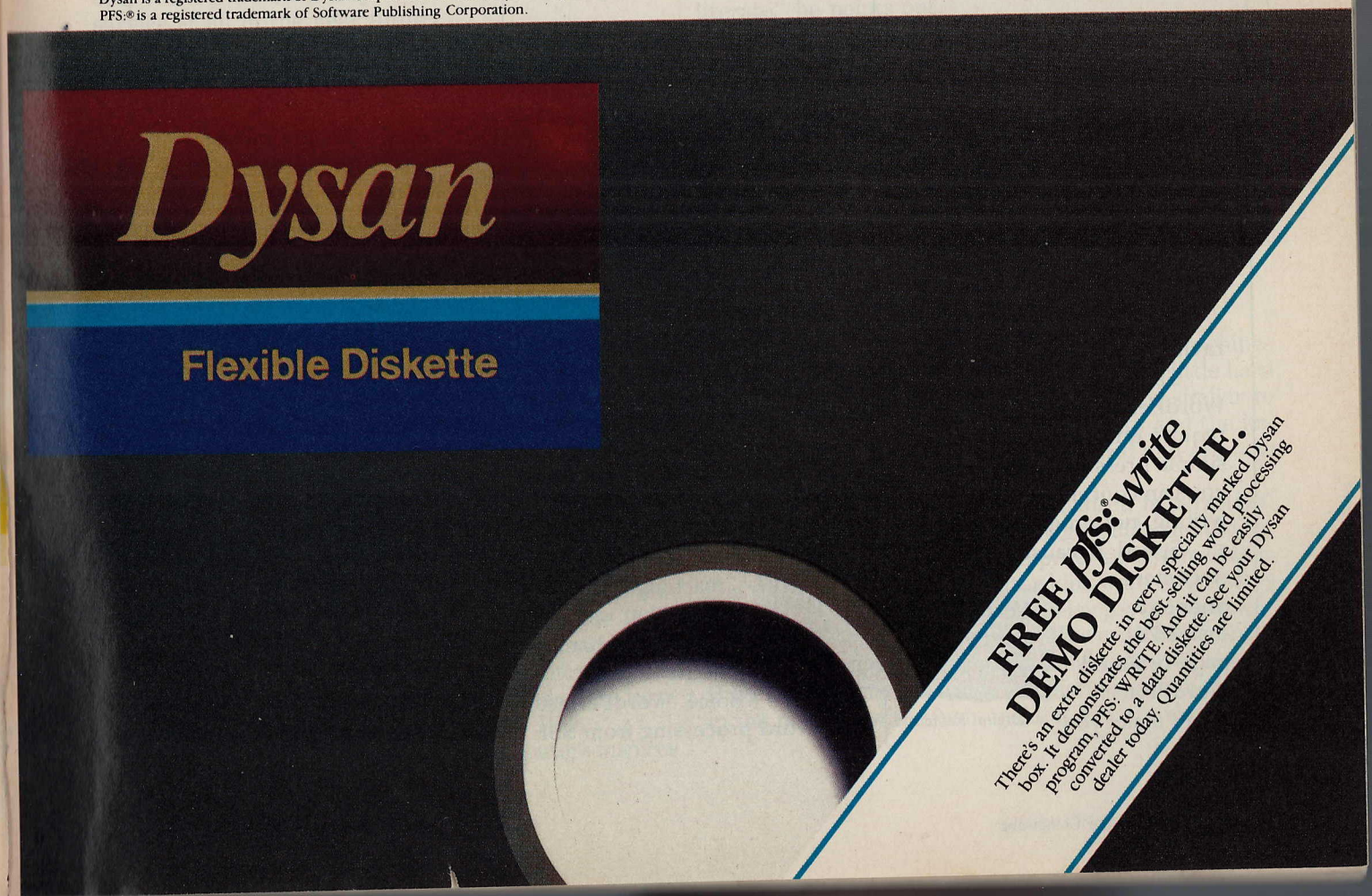
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in general use within 10 years.

Telecommuting is another futuristic phenomenon that is here today. It is also one whose glamour has somewhat obscured its practical drawbacks. For many, of course, it is the New Jerusalem to work in the comfort of home, away from office politics and supervision, at a time and pace of one's choice, without the daily expedition to and from the workplace. It also opens up jobs for the handicapped, the elderly, and mothers with small children. Employers also profit. Companies like New York Telephone have discovered that telecommuting can increase productivity by as much as 50 percent. In addition, as it reduces the need for office space, employers can save on rent.

However, telecommuting has hidden problems. Many people enjoy the "distractions" of the office, or feel that a presence close to the boss enhances their career, or find that the constant proximity of the family raises tensions, or simply lack a suitable working area in the home. Many corporations are unwilling to even give it a try.

Personal computers may ultimately create an economic rift between those who own them and those who don't. For instance, the growth of telecommuting could erode the distinction between business and home uses of the telephone, with the result that home rates will rise. The phone network is currently being made digital anyway, and this improvement, while fine for computer users, may hike rates for everyone. Hence, Leonard Siegel, director of the Pacific Studies Center in Mountain View, California, estimates that 9 to 30 percent of the population may not be able to afford phone service at all in the near future.

Persons without computers may find themselves second-class customers in other ways. For instance, since home banking costs less than check processing, financial institutions might well keep the price of home banking low and let that of checks float upward. A similar dual rate could result from electronic mail. According to Siegel, if enterprises like MCI Mail continue to grow, postal delivery could become slower and more costly. Moreover, as bills constitute 65 percent of all first-class mail, home banking could play a major role in undermining the U.S. Postal Service. Again, computer users would profit, others would not.

Anxious Parents and Classroom Computers

The most salient psychological effect of the machine has been the public yen for "computer literacy." Parents feel their children require the technology to walk into the new age. They have been urging schools to buy computers. At the beginning of 1984 some 300,000 personal computers were in schools.

However, this rush to the future has stumbled over some of the limitations of the present. Numerous teachers have had to take crash courses in the field. Many programs do not dovetail into the curriculum, and others simply give drills or unimaginative tutorials. "Too much computer software is simply electronic page turning," says Secretary of Education T. H. Bell.

But the desirability of schoolroom computers inspires more debate. Joseph Weizenbaum, an MIT professor of computer science, says that the goal of computer literacy is relatively pointless, since future computers will likely be special-purpose machines that anyone can operate. Instruction in programming, he believes, is wasteful in the lower grades, because computer languages resemble mathematical constructs, best approached with some intellectual maturity. Leonard Siegel adds that computers are siphoning funds from traditional education. "Computer literacy won't mean much if you're not functionally literate," he points out.

TELECOMMUTING like electronic mail, is a growing phenomenon whose glamour obscures its practical drawbacks.

Others are more optimistic. Henry Levin cites word-processing, foreign-language, and science-lab-simulation programs as among the more intriguing classroom applications. And Secretary Bell observes that computers should both motivate study—through attractive presentations, encouraging prompts, and responsiveness to individual interests—and allow pupils to learn at their own pace. This attitude currently prevails, and it seems personal computers will be entering our schools as fast as money permits.

Children of the Chip

If so, it behooves us to contemplate how the machines might affect children's development. There is little hard data on this topic yet, but certain concerns similar to those raised by TV—such as hyperactivity and the impact of video violence—have been voiced and are now receiving scrutiny.

Do personal computers make children hyperactive? Some contend that the eye-catching visuals and the immediate interactivity of the computer accustom kids to flash. "I've found that computer kids were stressed by reading," says Craig Brod, a Berkeley psychologist and author of *Technostress* (Addison-Wesley, 1984). "Books are too slow, and kids can't manipulate the characters," Brod says. "A smart teacher will discuss the differences in the medium with them, make it clear to them what

CONTINUED ON PAGE 177

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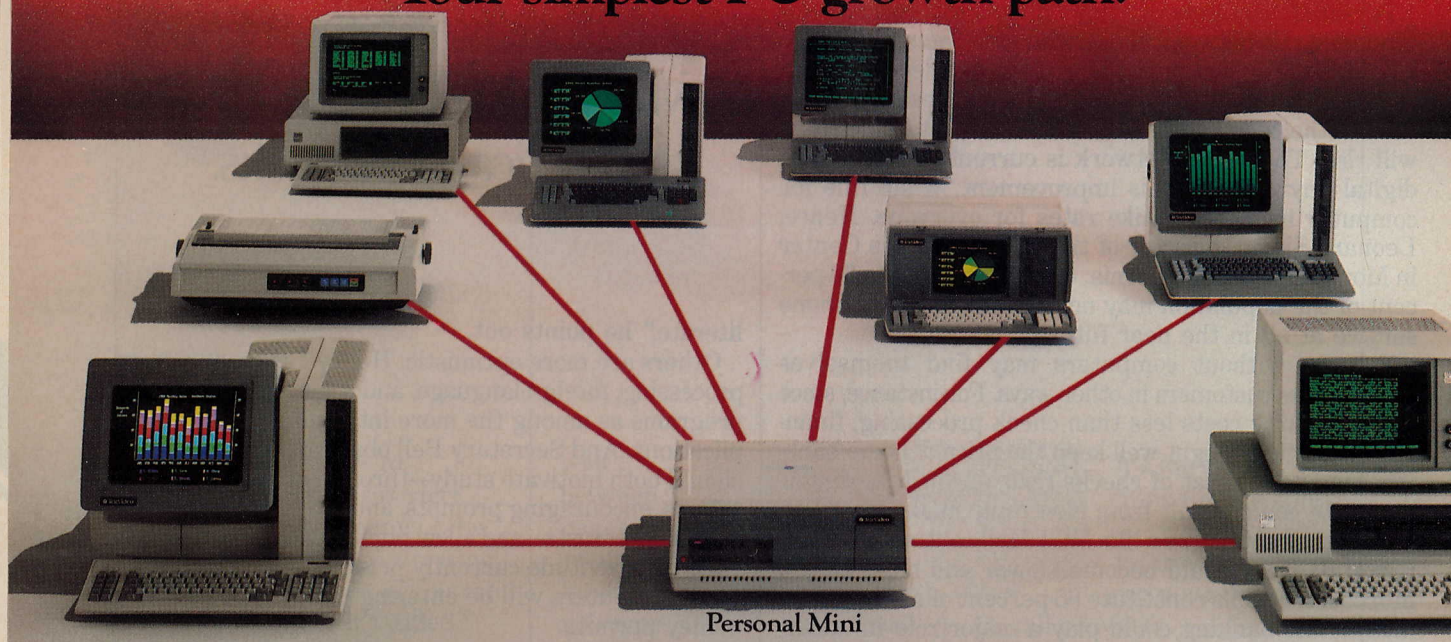

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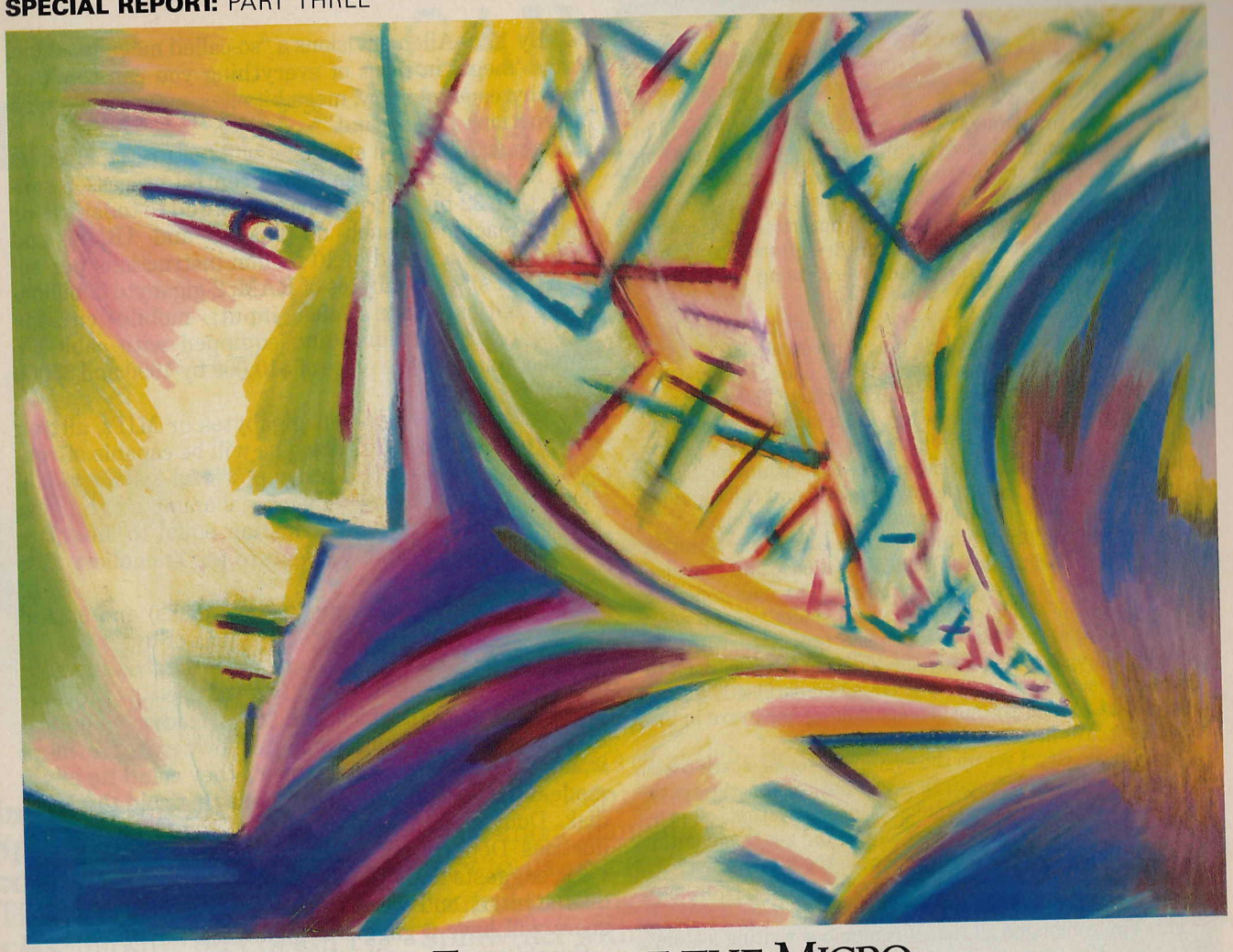

THE FUTURE OF THE MICRO: Looking Ahead at the Next Decade

In 1964, the king of the crystal-ball gazers, artificial intelligence researcher Arthur L. Samuel, looked into the future and made a bold prediction:

Computers are not going to get much bigger; in fact, they're going to get much smaller . . .[there will be] private ownership of computers of limited capabilities, which [will] also serve as remote terminals to communicate with the centrally located computers for the solution of larger problems. Computers will in any case be as convenient to use and as readily available as the present-day telephone.

Samuel credits his remarkably accurate forecast to one technological advance. "In 1964," he explains, "the transistor had been discovered but hadn't been applied well to the computer." Today, there is no single, epochal advance to point to, and Samuel admits, "It's much harder to predict the future right now."

Still, predictions are being made. Some are grandiose; some are conservative. Some directly contradict each other. But virtually all the predictions now being voiced share a common element: they are optimistic about the future of the personal computer.

Why? Think of a $120,000 minicomputer. Now reduce it in size and cost until it approximates the microcomputer you own now. That's what the micro of the 1990s will be like. Some experts even think the micro of the future will be three times as powerful as a DEC VAX 11/780 minicomputer and cost about what you pay now for an IBM PC XT.

In short, the machine we call a "personal computer" will be the answer to the dreams of business people and scientists—an easy-to-use electronic Goliath that sits on a desktop and stores and sorts data like a contemporary minicomputer for a fraction of the cost.

Inspirational Business Machines

"The hardware is going to be spectacular," says Jonathan Allen, a professor of computer architecture and integrated circuit design at MIT. "Even though I know the numbers, it is hard to imagine how good it will

Pete Carey is a reporter based in Palo Alto, California, who has written extensively about Silicon Valley and the electronics industry.

Illustration by Anthony Russo

MY FIRST PERSONAL COMPUTER

WILL HEARST *is the publisher of the* San Francisco Examiner.

My first time. It's not what you think. I guess I'm identified as an Apple person, but my first computer was actually a General Automation minicomputer. The company I was working for had been developing a project for computerized newspaper typesetting. The project had faltered—software problems (surprise?)—and the computers were being sold off or donated to schools.

The guy who ran the project said I could get one at rock bottom price—NOTHING! He made this excellent deal even better by throwing in some peripherals, like a Teletype and cassette-tape storage unit with an interface. This computer came with a detached card cage and a bunch of wires and cables to connect it to the interface and the interface to the tape unit. Best of all, my pal had set aside one of the bigger machines. The little ones had 4K and the big ones 16K—we're talking 1975 here and that was deluxe.

The catch was I had to pick it up in LA. Larry Kramer, now the Metro editor at the *Washington Post*, and I headed out and made Van Nuys by midnight. The next morning we went to the Wilshire address and loaded up the gear. It was a sad scene. The staff on the typesetting project acted like I was taking away the kids. On the way back to San Francisco we were stopped for speeding. The Highway Patrol asked about the suspicious-looking hardware in the back seat. We had to talk fast.

Back in the city, I set up the system on top of a card table in my bedroom. Cords ran to every outlet. But the truth is, I was never able to do much with this system: all programming was in assembly language. I did get the monitor up and running and fooled around with the tapes—big deal. It was basically user-irritable, but the important point was that I owned a general-purpose computer.

The Apple changed all that. I remember writing a story for the *Examiner* about the personal computer phenomenon: Byte Shops, MITS, and all that. I interviewed Bob Albrecht of the People's Computer Company. He said a new thing was coming, a computer with no switches or lights on the front panel. How could you tell if it was working? I asked. It shows you on a TV, he said. It seemed farfetched to me, but I put it in the story anyway.

When I bought my Apple II Plus, number 375 off the line, I was impressed by crazy things: interface cards inside the case, Sargon on tape, BASIC with real division. And someday I would buy a disk drive. I never believed I would need a monitor. The second program I bought was an assembly-language editor on tape from Microproducts. Why buy a computer unless you were going to program anyway? The best part then, and now, is making it do tricks, finding out for yourself the secrets of the machine.

I still hear people ask, "What can you do with a computer?" They just need an excuse, a reason to plunk down the cost of a trip to Europe for a box of sand. So everybody plays along. The salesperson says, "OK, so you want to make a database of the stuff in your garage. Well, you'll need an XT for that. Step over here." And the buyer pretends it all makes sense.

I still love the customer who says, "I just want to entertain myself, maybe learn something. Which of these has the best software?" That person knows something about computers. □

be." By 1990 Allen envisions a "so-called mega-machine. Put a 'mega' in front of everything you can think of: megabytes of memory, mega bits per instruction, mega instructions per second."

The machine Allen speaks of will feature capabilities that look something like this: a central processor handling true 32-bit instructions (compared to today's 8- or 16-bit machines, such as Apples and IBMs) and operating at a speed of 10 million instructions per second (MIPs); 4 megabytes of RAM; 2-gigabyte (2-billion-byte) optical disk; voice input; mobile citizens band/satellite terminal; and equipped with cable-TV connections—for the price of $10,000 by 1990 and $5000 by 1995.

Whether you care about gigabytes or MIPs, all you need realize is that this machine will be capable of running expert-system and other powerful software, will support real-time three-dimensional animated graphics, will be able to access information equal to an entire reference library, and will feature the friendliest user interface imaginable.

Winchester magnetic disks (hard disks) and optical (laser) disks capable of storing billions of bytes will let micros begin to function as stand-alone databases. About 75 percent of the data on many databases is static, archival information, which could be placed on an optical disk and sold to microcomputer owners. If owners wanted the remaining 25 percent, they could tie in via modem to the commercial database that sold them the disk. Douglas McVeigh, director of the Computer Industries Department of SRI International in Menlo Park, suggests that "if we can get truly erasable optical disk storage, and we can, then it looks like . . .micro users will have a gaggle of gigabytes."

Graphics is one application that will soak up the computational power of the 1990s micro. Game designer Eugene Jarvis, who created Defender, drools at the possibilities for graphics on the machines of the '90s while nervously wondering what else to do with all that power. Jarvis predicts that future micros will be able to produce very sophisticated graphics, including "3D projections for complex games and simulations that even a Cray 1 (the current leading supercomputer) isn't up to yet." The power for three-dimensional graphics will come from special-purpose chips that are getting cheaper and more capable every year.

Portability, a big trend of the future, will be carried to small, "vest-pocket" computers that can tie in with remote mainframes or other micros. Coupled with networks that will grow from today's telephone and cable television systems, portability portends a tremendous amount of dialogue taking place from micro to micro. Some experts envision "gateway" mainframes in each major population area to allow access to a national cable network. Already, some communities are making provisions for computers to tie into their cable-TV systems.

Experts at SRI believe that with the power of the future micro, the average corporate computer user won't

CONTINUED ON PAGE 178

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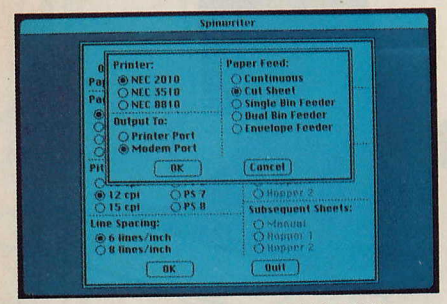

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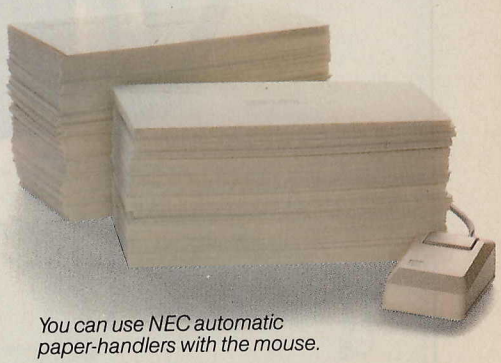

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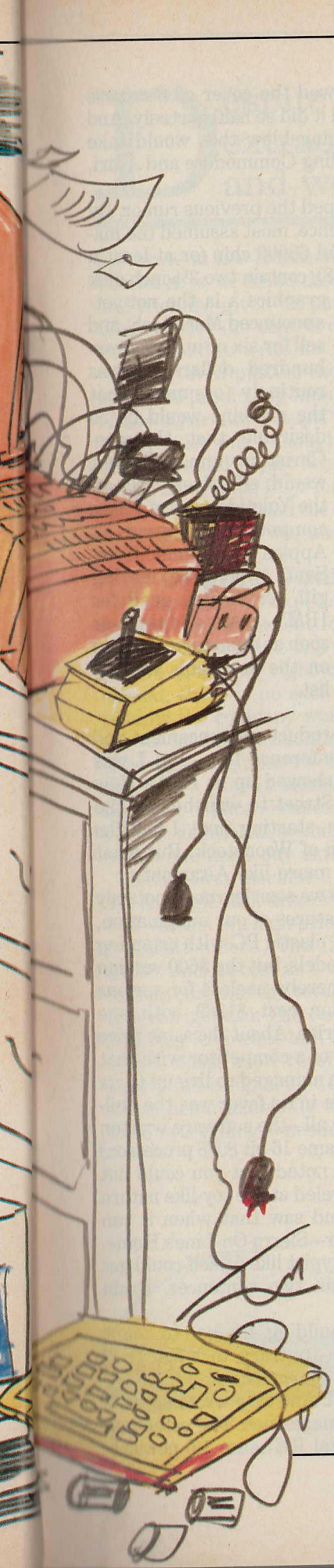


THE LIFE AND TIMES OF PC JUNIOR

Will the new PCjr fare better than the original?

BY STEVEN LEVY

It's hard to believe that the PCjr, IBM's much-heralded foray into the home computer business, has been on the market for less than a year. It seems like forever. Much of that year, of course, has been spent speculating when IBM would fess up to what became widely recognized as a monstrous miscalculation, and either enhance the $1269 machine into a useful piece of machinery, or drop it altogether.

IBM, with its usual candor, insisted that nothing of the sort was in order. *It's a perfectly wonderful machine,* said the folks from the IBM Entry Systems Division at Boca Raton, Florida. *It's only you guys from the press who don't like it.*

STEVEN LEVY (*left*) is a contributing editor of *Popular Computing*. Illustrations were drawn by Keith Bendis; photographs are by Guy Hand.

But even IBM had to admit that while people were lining up to buy Junior's chief competitor, the Apple IIe (and later the IIc), the PCjr was selling slowly—very slowly. In fact, according to the best available estimates, the 50,000 Apple IIcs sold on the day of its introduction represented almost as many PCjrs sold in the machine's entire first incarnation.

Finally, nine months after its introduction and seven months after its first appearance in stores, the "new" PCjr was unveiled, almost surreptitiously, in a July 31 press conference where the supposed main event was a reading program for schools. Not until the final paragraph of press-kit announcements did that release mention the enhancements that transformed the tragic Junior into a new machine, demanding reevaluation. "In addition," reads paragraph four of that fateful release, "the company introduced new features and options for the PCjr, including a typewriter-style keyboard, additional memory and power attachment options, a speech synthesizer, and new cartridge and diskette programs." *Oh by the way...we're floating a scheme that may salvage the biggest flop in the history of computing.*

This article is more or less a review of this "new" machine. But the PCjr calls for something other than a standard hardware review. The machine is not merely another alternative for prospective buyers: it represents a major chapter in the history of personal computers. Despite its unprepossessing appearance, the PCjr is a virtual Rosetta stone whose meaning and message must be understood in order to understand the success or failure of *any* home computer that comes thereafter. We must not only evaluate the PCjr as a potential addition to our home and office, but we must seat it at the dinner table to gauge its conversation, lay it on the couch to psychoanalyze it, pull down its drawers to check for rashes. And once the verdict is delivered, we must ponder *why*. To do less would be to forget the astonishing importance with which we all imbued this machine. Indeed, the entire computer industry was nearly hysterical with anticipation in the months before November 1, 1983, when IBM hastily convened the nabobs of computerdom to show for once and for all the reality of the chimera that people had been calling "Peanut."

In fact, those were the glory days of the PCjr, those days and weeks before the announcement, because the rumors of the Peanut's capabilities had stretched far beyond reasonable expectation. Such was the fear that IBM had thrown into the industry. Its workhorse, the PC, had been such an undeniable success that many were ready to concede the entire field—lock, stock, and microprocessor—to the boys from Boca. "AND THE WINNER IS...IBM!" crowed the cover of *Business Week*, and those who refuted it did so halfheartedly. And now would come the crushing blow that would take Apple, and even the low-balling Commodore and Atari, down for the count.

Each rumor of Peanut topped the previous rumor. By the time of the press conference, most assumed the machine would use the powerful 68000 chip (or at least a faster chip than the PC's 8088), contain two 3½-inch disk drives, support bit-mapped graphics à la the not-yet-announced Macintosh, and sell for six or maybe seven hundred dollars. It was routinely assumed that the machine would be so desirable that the pre-Christmas announcement would effectively kill off the Yuletide sales of IBM's competitors—instead of Apples or Commodores, Santa would be leaving gift certificates good for IBM's new addition—as soon as one's turn came up on the inevitable waiting list.

The Big Event

IBM cast the event as a "product announcement and demonstration"—no press conference this—and I was among the journalists who showed up at IBM's New York headquarters on 57th Street to wait behind the velvet ropes until the 10 a.m. starting time. I felt like I was at the eighties version of Woodstock. But what awaited us was, to my eyes, more like Altamont.

The Peanut—or the PCjr, as we soon learned—not only lacked the state-of-the-art features of our imagination, but seemed dinky, a smaller, plastic PC with crippling limitations. It came in two models, but the $600 version had no disk drive and was thereby useless for serious computing; the other version cost $1269 with one double-sided 360K-byte disk drive. About the same price as an Apple IIe, it was more of a competitor with that than with the the Mac (which managed to live up to *its* rumors). One thing it did have in its favor was the ability to run some—but far from all—the software written for the IBM PC. (It used the same 16-bit 8088 processor.)

I looked over the machine, noted that you could not add a second disk drive, marveled at the toy-like nature of its "Chiclet" keyboard, and saw that when it ran IBM's choice of word processor—Sierra On-Line's Homeword—even a medium-speed typist like myself could get a full line ahead of it within two sentences. Brain damaged!

But even before I left the building, I began to doubt my own judgment. Because—contrary to what IBM would later say—most of the journalists and industry pundits swooned with approval. And they wrote up their approval in newspapers and magazines. The esteemed Esther Dyson of the influential RELease 1.0 newslet-

Despite its Chiclet keys, we found the machine extraordinarily cute and friendly, given its parent, and we expect it to be a big winner.

ter wrote in her November 28 issue that "Despite its Chiclet keys, we found the machine extraordinarily cute and friendly, given its parent, and we expect it to be a big winner (no controversy here). Software vendors have rushed to write for it; customers have rushed to order it, even putting money down; consultants have rushed to predict big numbers for it, feeding the frenzy of the other two groups."

Maybe it's me, I thought. Maybe the PCjr is a good machine, and I'm just not seeing it. But soon after I received an original PCjr for evaluation, I found out what the critics missed and the public divined fairly quickly—the original PCjr was an overpriced, limited machine.

The Original Junior

In discussing my experience with the "old" PCjr, I will restrict myself—except for a few explicit exceptions—to the features that one might still find in the "new" PCjr. I should say right away that as far as IBM is concerned, there is no such drastic distinction, though I assume the company would be very upset if any reviewer made an evaluation of the PCjr without considering last summer's enhancements. And in fact, the "new" PCjr is literally the old one, priced a few hundred dollars cheaper, with a different keyboard and the addition of memory and/or speech boards, for which one must pay extra.

So the first machine I got was in large part the 128K, single-disk-drive PCjr as it is today. (The $600 64K version is a high-priced doorstop, so I won't give it attention here.) The 128K model's cost then was $1269, and its cost as I write this is $999. It came in four cartons; the total bulk was about the size of a refrigerator. The central processing unit itself was only 3.8 inches tall, 13.9 inches wide, and 11.4 inches deep, but I received along with Junior a nearly full complement of the hardware and software then available for it. So I figured I would have everything I needed.

I set about unpacking, and easily followed the clear, if somewhat condescending instructions (don't get me wrong, I'll choose condescending over unclear any day of the week) to make the very simple connections between computer and television. No tools were needed. I plugged in the cord with the brick-like external power supply to the computer on one side and the wall on the other. (There is also room for joysticks, light pen, and a serial port.) And that was all I needed—I thought. Then I read a piece of paper that said: IMPORTANT; DO THIS FIRST. It said to upturn the keyboard, slide open a battery compartment, and "Insert the four AA batteries as directed." *What* four AA batteries? Was IBM joking? Were they selling a $1269 computer with *batteries not included*?

Yes. I finally got batteries by pilfering from my mate's Walkman. It was a minor, but telling inconvenience of the PCjr. Apples, Commodores, Ataris, and IBM PCs do not require four penlight AA batteries. Junior does. I know this is due to the one true innovation of the PCjr,

the infrared scheme that lets you use the keyboard without a connecting wire, but it took me 15 minutes to realize that the benefits of this feature were dubious at best. When I work with PCjr on a desktop, it doesn't matter whether there's a wire or not. When I work with the keyboard on my lap, the board often moves to an angle that directs the infrared light away from the target on the CPU unit—and my input is mangled or lost.

Obviously, infrared technology, at least on this machine, has not reached the point where one can work without a wire attaching the keyboard to the computer. So I began tearing up boxes to look for the optional IBM PCjr Keyboard Cord. For those of you who aren't reviewers this item costs $20 at Authorized IBM Personal Computer Dealers. This item has the proper connectors, but is basically a plain old wire.

The wire is the least expensive of the essential PCjr "options." Of course, the monitor is not included in the price. Since the output of a color television is often fuzzy (as it was with mine—even in large-type 40-column mode I couldn't make out any words), plan on getting a good color monitor for four or five hundred dollars. Paying extra for a monitor is no surprise, but in the strange world of IBM, something even as basic as the operating system costs extra—so every PCjr owner winds up paying $60 for DOS 2.1.

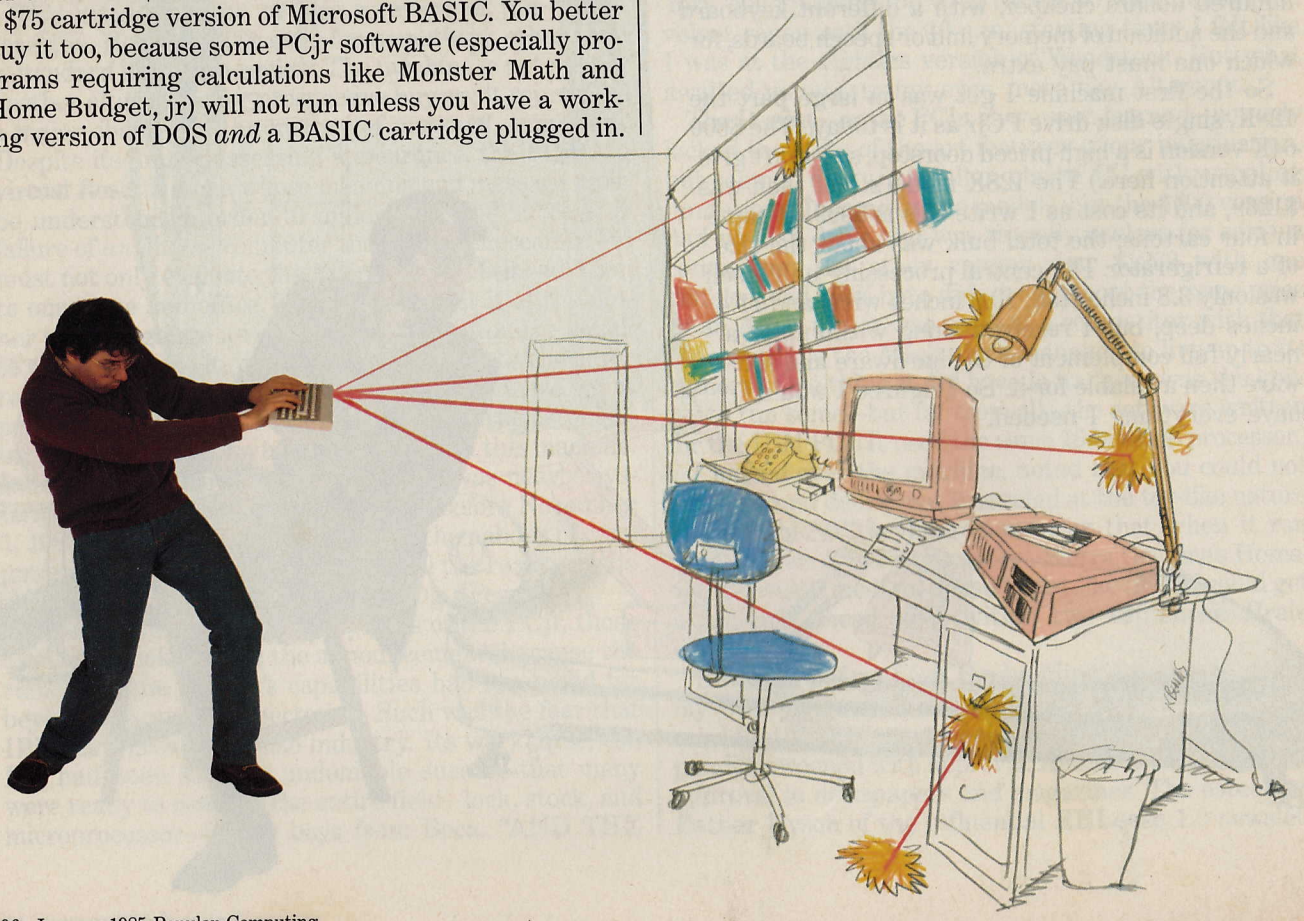
Also, although every PCjr has a version of BASIC in read-only memory (ROM) this is a "Cassette Level BASIC" that works only with tape cassette storage—technology obsolete for over four years, except perhaps for owners of $97 VIC-20s. But IBM will gladly sell you a $75 cartridge version of Microsoft BASIC. You better buy it too, because some PCjr software (especially programs requiring calculations like Monster Math and Home Budget, jr) will not run unless you have a working version of DOS *and* a BASIC cartridge plugged in.

Don't forget a printer, either—you can buy the rather primitive IBM PC Printer for $175, or you could add any of a number of parallel printers, if you wish to spend an additional $99 for the PCjr Parallel Printer Attachment. It does not take much time for the PCjr to become a $2000 machine.

Adventures in Wonderland

That said, I sat down to divine the meaning of the PCjr. I did not have to insert a piece of software to get to the heart of the matter. The machine, correctly discovering there was no disk in its single drive, immediately reverted to the rather useless (except for game-playing purposes) Cassette BASIC. But following the colorful instructions, I pressed the Escape key to bring up a piece of software burned into every PCjr ROM, there forever, available to run at any time, uncrashable and irreplaceable. This piece of software is called Keyboard Adventure. Its purpose is to teach me the wonders of the IBM "Freeboard" keyboard. It does this by means of a cartoon character named "PC," who cavorts around the screen as he explains the difference between a capital letter and a lowercase one. "PC" slightly resembles Gerald McBoing-Boing, without his talent for aural mimicry.

Keyboard Adventure, like many selections from the "old" PCjr library, seems to be directed at an age group old enough to read full sentences, but as yet unable to grasp concepts like "above" and "below" (a $30 piece of software called Juggles Rainbow is devoted to those trying to make that very distinction).



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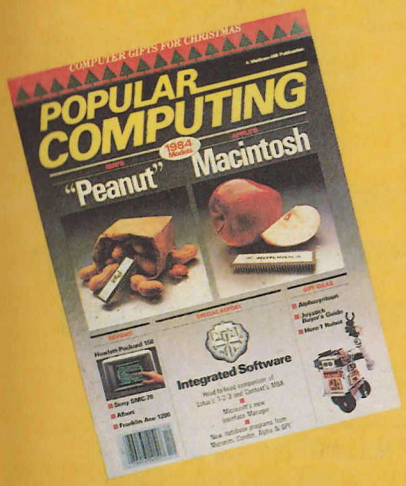

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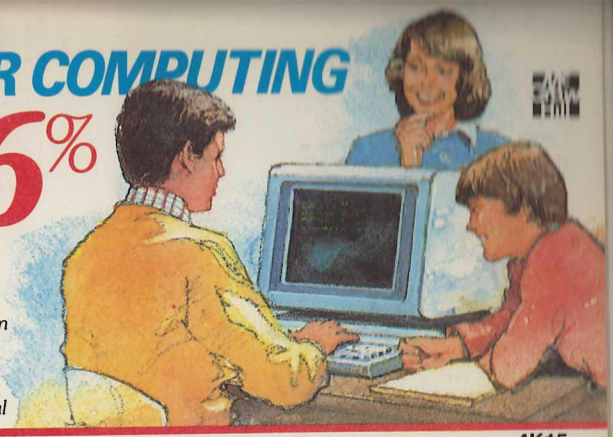

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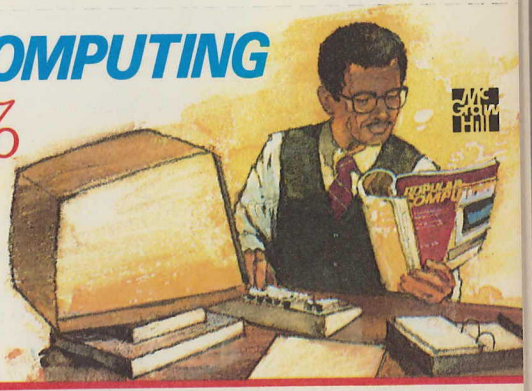

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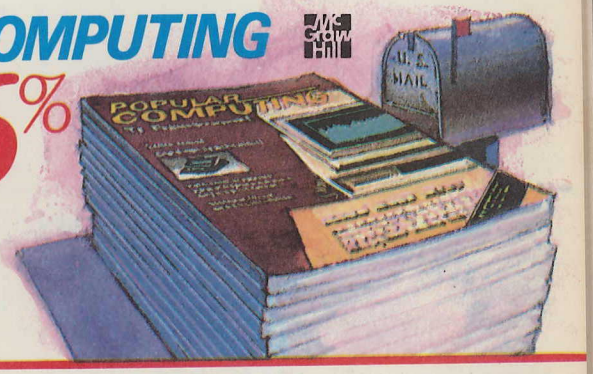

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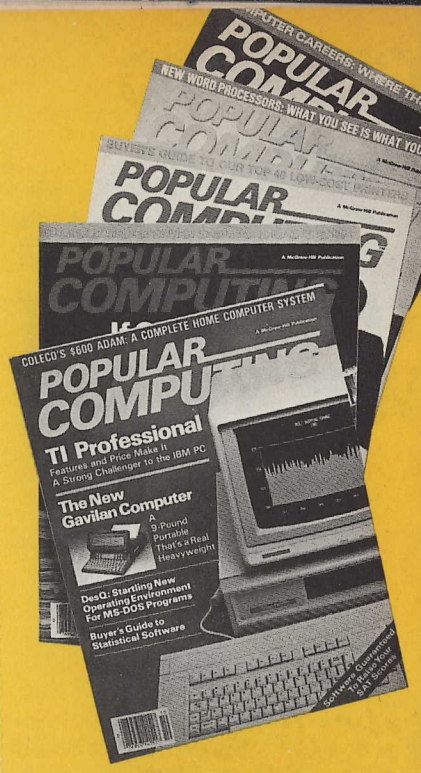
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The overwhelming evidence seemed to me that IBM had given us a machine for little kids that also runs some grown-up programs

Much of the PCjr documentation seems written at this precarious level, which makes for very weird reading when things get technical or some arcane point in BASIC is being explained. It's as if IBM assumes that PCjr owners are victims of a previously unclassified free-floating autism. A logical conclusion would be that this is due to IBM's urging that parents work with their kids to learn the computer. But if that were so, would *everything* in the manual be couched so simplistically? (Could not the parent, who plans to use PCjr for office work after little Tommy is asleep, explain things to little Tommy?) And why would Keyboard Adventure, a program that once mastered by even a 7-year-old need never be run again, be permanently burned into the machine?

The overwhelming evidence seemed to me that IBM had given us a machine for little kids that also runs some grown-up programs. Among those was a family budget program published under the IBM logo. But the you-are-a-moron tone persisted even here. When I ran this program, I felt that it was a classic example of software fascism: it presented me with a menu of several choices. The only one that worked was CREATE/CHANGE BUDGET. After pressing that choice, I got another menu. The one logical choice of the six options seemed to be: CREATE BUDGET. So I pressed that choice. I then got this message: CREATE A NEW BUDGET? (Y/N). Exasperated, I pressed Y. Amazingly, the program did not leave it at that. ARE YOU SURE? it asked.

Then there is the instructional disk included with Junior. Step by step it takes you through difficult concepts like hitting two keys at once for functions. It is presented in a Wonderlandish, game-style fashion. A disk of sample programs is also included with Junior. One simply emulates a typewriter. Another is a Computer Hangman game, something I thought had gone the way of the Teletype terminal. Another program prints out your shopping list.

Now, there is nothing wrong with directing a computer toward the simpler things in life. Education is important, as is easing the difficulty of tasks one does in running a home. Still, there was nothing the PCjr seemed to offer in those fields that wasn't already implemented, and better, on lower-priced computers.

So what were the advantages of the PCjr? Mainly, the sound and graphics capabilities—they surpassed those of its older brother, though of the first few games IBM had released on cartridge only one was even vaguely interesting, and that was Crossfire, a Sierra On-Line program released two years earlier on other computers. Anyway, the cartridge translation of Crossfire took little advantage of the PCjr's TI 76496 three-voice sound generator chip. (A few months later, Sierra On-Line issued a disk-based version of the program that had kind of a rock music background.) I began using IBM's new $400 PCjr color monitor, which effectively displayed bright color and delivered loud, if not clear, nonstereo sound. But was not as sharp in displaying characters as the regular IBM color monitor; 80-column mode was fairly fuzzy.

It would be up to third-party software publishers, then, to take advantage of sound and light. As of this writing, little of that software has appeared.

To be worth even part of its steep price tag, the PCjr should be able to do some fancy telecommunicating and some decent word processing. The former went smoothly: The $199 modem card plugged neatly into one of the two open expansion slots inside the machine. I was able to use IBM's Personal Communications Manager program to hook up to on-line services (though first I had to figure out how to turn off the automatic line feeds that prevented me from using Telenet). Word processing was tougher, but eventually I found the Homeword program to be usable for short notes, after I discovered something buried in the manual—turning off the icons on the bottom of the screen allowed the program to run fast enough to keep up with my typing. I later learned from technical people that the method the PCjr used to refresh the video output made slow-running programs a chronic problem.

In any case, most of the programs that seemed to make the PCjr useful were things like the PFS Series—low-power IBM PC programs which also ran on Junior. (IBM now publishes these programs in its "Assistant" series.) You could also use PCjr to run the very decent IBM Logo program or Visicalc. And it plays a mean game of Ultima II.

Down for the Count

As months went by, though, it became clearer and clearer that this computer did not, and would not, deliver on its promise. The chief culprit, of course, was the keyboard. Even though IBM kept insisting that it was only a few disgruntled journalists who disliked it, the keyboard was universally despised, and with good reason. The keys, which really did look like Chiclets, were spaced apart from each other and were not labeled, except for faint markings on the base of the board above each key. Ostensibly, this was so that one could use keyboard overlays, perhaps ones that took advantage of the fully programmable keyboard. Still, for someone like me, a half-touch-typist who often refers to the keys, the keyboard is a disaster. Whenever I got rolling and tried to touch-type, I felt like I was trying to climb a

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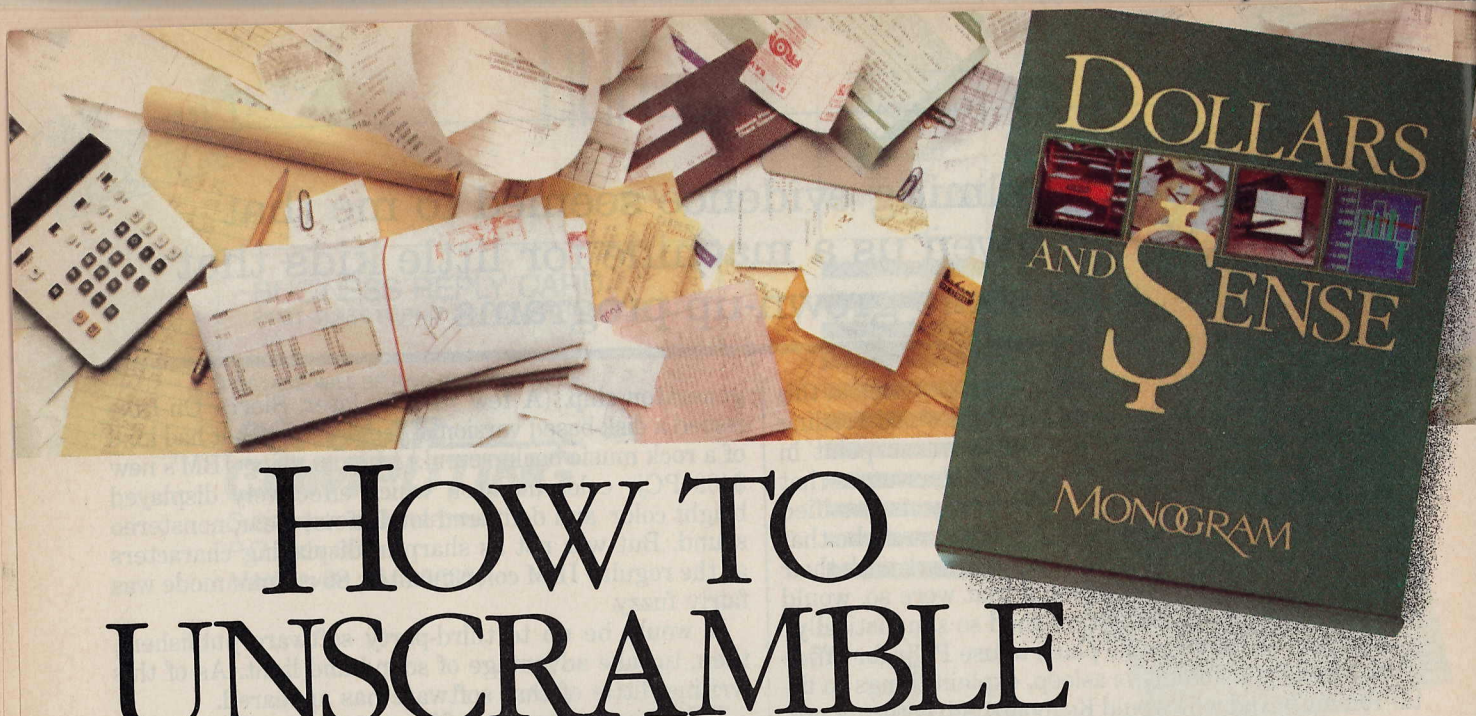

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The DELICATE ART of DIGITAL TYPE

Classical typographers juggle pixels to increase readability

by Doug Stewart

In the old days, way back in the 1970s, people didn't give much thought to how type looked on their computer screens. Computers were for programming, not reading and writing. Why get picky about the alphabet? After all, it's as simple as ABC.

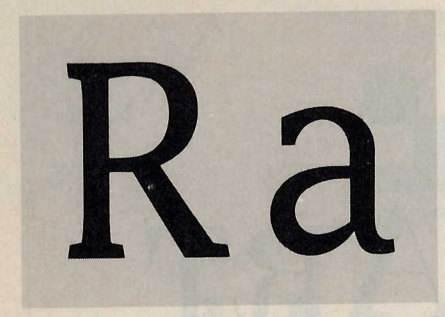
Today, in the era of word processing, electronic mail, and spreadsheets, the way text appears on-screen is of critical importance. It's no longer enough to leave the design of a computer's lettering to the hardware engineers; a decade of headaches and eyestrain has proven that.

But poor computer typography can have effects far more profound than mere eyestrain. Too often, the blocky, crude shapes of on-screen computer lettering remove the cues—the subtle details and visual harmonies—that our eyes are trained to expect from traditional typefaces. This makes it harder to distinguish letters and words. Reading becomes an effort, and our speed drops. We confuse words more easily. We tire more quickly.

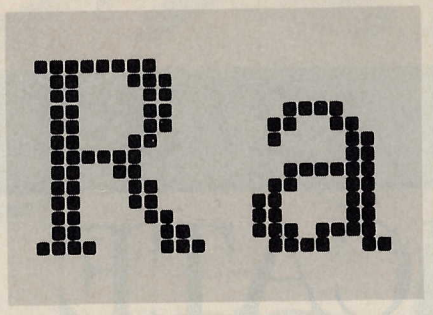
"Over an eight-hour day," says Charles Bigelow of Bigelow and Holmes in San Francisco, "unease accumulates if the letter shapes don't look quite right." Bigelow, a traditionally schooled typographer, believes that reading is the weak link in the chain of electronic communications. "If the link snaps under the strain of poor-quality letters, the whole chain is broken."

Fortunately, some hardware and software

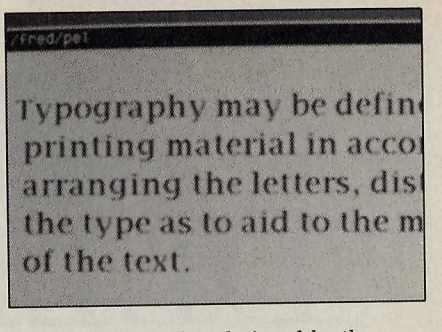
Doug Stewart is a freelance writer in Ipswich, Massachusetts.



A typeface designed by Holmes and Bigelow, shown at high resolution. The dot density appears as a solid line.



The same typeface at low resolution. The R fills an 11 by 13 grid, a luxury for most personal computers.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Pellucida, a typeface designed by the Bigelow and Holmes studio, retains a traditional, calligraphic flavor.

companies are responding by hiring traditionally schooled typographers to sculpt alphabets for video display—even at the coarsest resolutions. "It's generally assumed that a low-resolution dot matrix is so limited, any fool can do it," says Mike Parker, head of Bitstream, a Cambridge, Massachusetts, producer of digital type. "But the smaller the matrix, the more important each dot is. For that, you need your best designer."

THE IBM PC'S LETTERFORMS COME IN FOR A GOOD DEAL OF CRITICISM, IN PART NO DOUBT BECAUSE OF THEIR UBIQUITY.

Hard Facts at Low Res

Images on computer screens are made up of pixels (*pic*ture *el*ements) arranged in rows and columns. Each letter on a screen is allotted a small rectangular grid. Instructions in the computer's microprocessor chip or, more recently, in firmware or software govern which pixels in the grid light up and which stay dark. A 7 by 9 dot matrix is fairly typical of monochrome personal computers these days. Ascenders, descenders, curlicues, and swashes must all fit within this matrix. Some computers, like the old Apple IIs, are even more strapped for space, squeezing their uppercase alphabets into 5 by 7 grids. This doesn't leave much room for artistry.

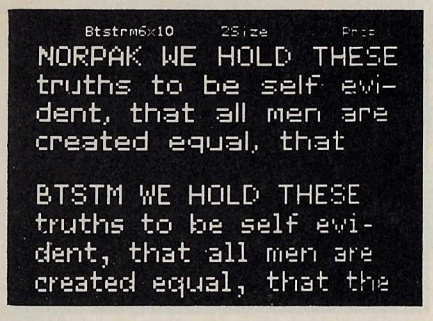
A number of problems crop up when letters contain less than 12 pixels from top to bottom. Jaggies, the stair-step effect most noticeable in diagonals, begin to look climbable. Simulation of curves is nearly impossible. The luminous haloes around pixels, which allow a lit-up screen to look uniformly illuminated rather than speckled, can make such letters as *e*, *c*, and *o* look alike.

Different Approaches

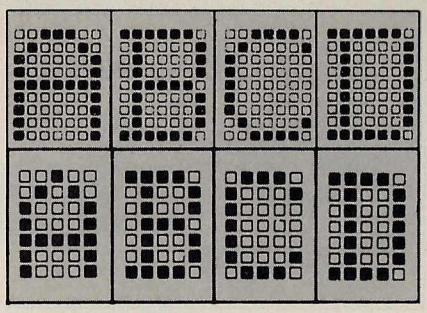
Typographers approach these problems from a unique point of view. "When engineers design type, they tend to get excited about symmetry," Charles Bigelow says. "They like to make the *b*, *d*, *p*, and *q* reflections or rotations of a single master image." With letters that look alike, he explains, the eye is confused. Small wonder that computerized spelling checkers are so popular—when type becomes homogenized, typos become camouflaged. Engineers, Bigelow says, often concentrate on eliminating jaggies, which means removing diagonals and curved strokes wherever possible. The *O* becomes boxy, the *S* angular, and the *W* begins and ends with vertical strokes. Wim Crouwell, a Dutch designer, experimented with an extreme version of jag-free type. His New Alphabet contains only vertical and horizontal strokes and right angles. It is virtually unreadable.

When typographers talk about digitized type, the IBM PC's letterforms come in for a good deal of criticism, in part no doubt because of their ubiquity. IBM color and portable versions are particularly vulnerable to complaint, as both operate permanently in "graphics mode" rather than "text mode." The characters on the color PC, officially billed as fitting an 8 by 8 grid, are compressed and hazy. The uppercase *M* and lowercase *m* look virtually the same, and the top of the capital *T* resembles the thickened end of a baton. In both color and monochrome, IBM's use of rectangular rather than square pixels compounds the problem of readability, typographers agree. "You can't draw a decent circle," says Bigelow. "That's awful for font design."

Making individual letters recognizable is only one part of the problem for low-resolution type design. Readers don't read by examining letters one at a time; they recog-


Btstrm6x10 2Size Pnts
NORPAK WE HOLD THESE truths to be self evident, that all men are created equal, that
BTSTM WE HOLD THESE truths to be self evident, that all men are created equal, that the

Mathew Carter redesigned the top typeface, choosing more jaggy, typewriter-like letterforms than the original (bottom) videotext.

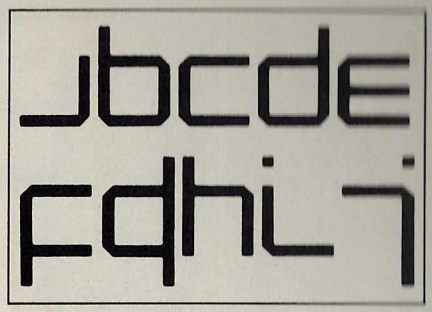


ALPHABETS ON A CHIP

For the first generation of personal computers, each 5 by 7 or 7 by 9 letter was fixed in read-only memory (ROM), and computer screens simply displayed what the chip provided.

The alphabets pictured above (7 × 9 top, and 5 × 7 bottom) are from Motorola's 66700 series. In some ways, the more detailed 7 by 9 alphabet is harder to read than the 5 by 7 version. The uppercase *D* is square and featureless and the *i* and *l* are forlornly narrow.

Chip manufacturers like Intel and Motorola no longer dictate how screen alphabets look because the cost of chip design has dropped and computer manufacturers can specify their own designs for a few thousand dollars instead of a few hundred thousand. Still, the ROM character sets have become something of a de facto standard.



Designer's Wim Crouwell's New Alphabet takes jag-free type to the extreme, using horizontal and vertical strokes only.

nize words by their overall shapes, the eye and brain absorbing them in clumps. As a result, typographers must pay attention to how type will be displayed on the screen as a whole. An offense to typographers everywhere is the text format of the Apple II and inexpensive home computers that plug into television sets. Lines are packed tightly together, and letters are blocky and squat, with a low aspect ratio—diagonals more horizontal than vertical—so the capital *Y*, for instance, resembles a single-stem goalpost. "When the space between words is greater than the space between lines," says Richard Southall, an expert in digital typography at Stanford University, "it's easy to lose yourself in a row. Your eye tends to read down, given half a chance."

Aaron Marcus heads a studio in Berkeley that specializes in the problems of screen formatting. "Engineers view the text-display problem as one of maximizing the number of characters on the screen, unlike graphic designers, who are trained to value the use of space," he explains. The result of packing letters onto a screen is the nearly unreadable 80-character text width on many computers, Marcus says, which invites the eye to skip or reread lines in a paragraph.

Typographical Tips

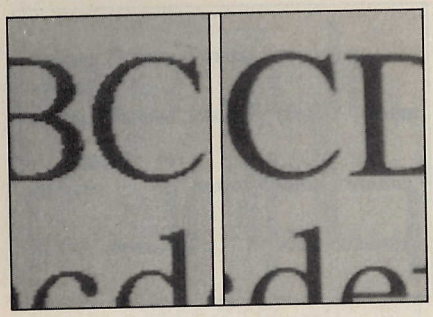
Designers of computer type would do well to understand certain basic rules of typography. Since Roman times, vertical strokes have been thicker than horizontal strokes. For readers of the Latin alphabet, this has become an ingrained aspect of legibility. When all the strokes of an alphabet are one pixel in thickness, stems look weak and spindly and serifs look heavy. "You subliminally rub your eyes," says Bigelow.

A second rule of good type is that alphabets should incorporate a variety of strokes: verticals, horizontals, curves, and diagonals. Fonts that break this convention, like Crouwell's New Alphabet or the machine-readable numbers at the bottom of personal checks, are decipherable all right, but they are not easily readable.

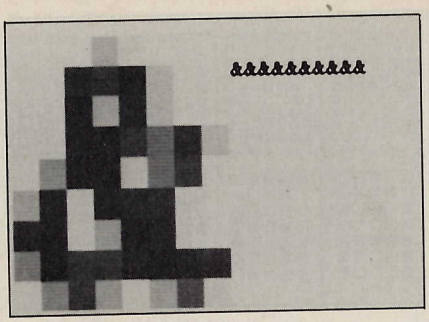
A third key to easy-to-read type is the maintaining of an even spatial rhythm along each line. As we read, we pick up information not just from the contours of letters and words but also from the smooth alternation of light and dark between and within letters and words. Bitstream's Mike Parker, a classically trained typographer, says this has been true since the days of Gutenberg and before: "It's the rhythm of the spaces that says things to the brain."

At the lowest resolutions, typographers have learned to correct certain tendencies that are common to computer type. Above all, they strive for familiar letterforms rather than innovative ones. "Whatever the resolution," says Bitstream's head typographer Matthew Carter, "I try to make characters look as typographic as possible." He adds that it's foolish to design letters that might accommodate a computer display but force readers to adjust to an unfamiliar shape. "Machines are perfectable," he says, "human beings are not."

For one 6 by 10 font that he was asked to redesign, Carter replaced a boxy, straight-sided *W* with a jaggy version that restored the letter's diagonals when viewed from a distance. He rounded corners and added single-dot terminals to lowercase *u* and *n*, although these changes, too, increased the font's jagginess. The com-



Bitstream's gray-scale system uses 3 bits per pixel, remarkably improving smaller, 8-point letters.

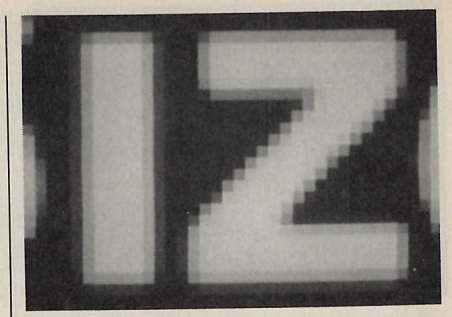


GRAY-SCALING IS SMOOTHER

With plenty of memory and a video monitor that offers shades of gray, a cure for the jaggies is possible. John Warnock, formerly of Xerox PARC and now head of Adobe Systems in Palo Alto, has pioneered a system called gray-scaling. Instead of assigning one bit per pixel, which simply turns the pixel on or off, pixels can be assigned two bits (for a choice of white, black, and two shades of gray), three bits (six shades of gray), or four bits (14 grays). This softens the edges of a pixelated form, giving an illusion of smoothness.

The gray-scaled ampersand (above) uses 4 bits per pixel, allowing 16 different tones, which make it more recognizable than a black-and-white version.

Warnock and others expect this technique to become widespread in personal computers once the hardware can accommodate it.



An enlargement of gray-scaled sans serif type to show gradations in shades along letterform boundaries.

pensating benefit, he explains, is a better differentiation among letters, and that is what counts in good type design.

Chilly Reception for Mac

The ground rules of the low-res game are beginning to change now that Apple's Macintosh has appeared. For the first time in a personal computer, Mac provides proportional spacing—*m* takes up more room than *i*, for example. And its bit-mapped characters, where no letters are stored in ROM and each pixel of each letter is constantly recalculated by the computer's microprocessor, means that letters can be shrunk and expanded and otherwise distorted at will.

Perhaps because the technology offers so much potential, type designers seem decidedly snippish when evaluating Mac's initial selection of fonts. Awkward, amateurish, frivolous, terrible, and infuriating are a few of the terms typographers use when asked about Macintosh fonts. Says Michael Arent, design director at Aaron Marcus and Associates, "They tried to include all the curlicues and subtleties of high-resolution type. They should have started with a particular resolution and said, 'Let's design a typeface for this resolution.' They've introduced some strange anomalies." One such anomaly is that for some fonts the jaggies increase in size as the letters do.

The problem is memory, according to Susan Kare, the person in charge of the appearance of Mac's typography. Because Apple wanted to unveil a wide assortment of fonts with the new machine, there wasn't room on its disk to offer fine-tuned fonts for each point size.

Nonetheless, it's clear that Macintosh's technology is the wave of the future. Even Bitstream's Mike Parker, who deems Mac "a triumph of style over substance," admits that Apple is leading the way in digital typography with its popularization of bit-mapping and variable widths.

As computing speed and screen resolution increase, as they inevitably will, do-it-yourself typography will become a new pastime. Not everyone welcomes the prospect. "A lot of it is going to be appalling," says Parker.

Toward Aesthetic Readability

The future of serious computer-type design probably lies with the software companies. Aggressive firms such as Visicorp and Microsoft have hired typographic experts to custom-design alphabets for their products, and more will follow as companies begin to realize that although computer users may not know much about type, they certainly know what they don't like.

As this trend continues, the industry at large will learn to accept the idea of relying on trained typographers. Charles Bigelow, writing for his fellow designers in *The Seybold Report on Professional Computing*, cited the aesthetic possibilities of low-resolution type: "Van Gogh painted with the coarse strokes of a stiff brush, and Seurat with discrete dots of color. . .The art of digital type design should derive its inspiration from innovative masters such as these, rather than to vainly seek quality in imitation." His plea may strike non-typographers as a bit more impassioned than the situation calls for, but the sentiment is sound. Coarse can be beautiful, and beautiful type is something we could all use. □

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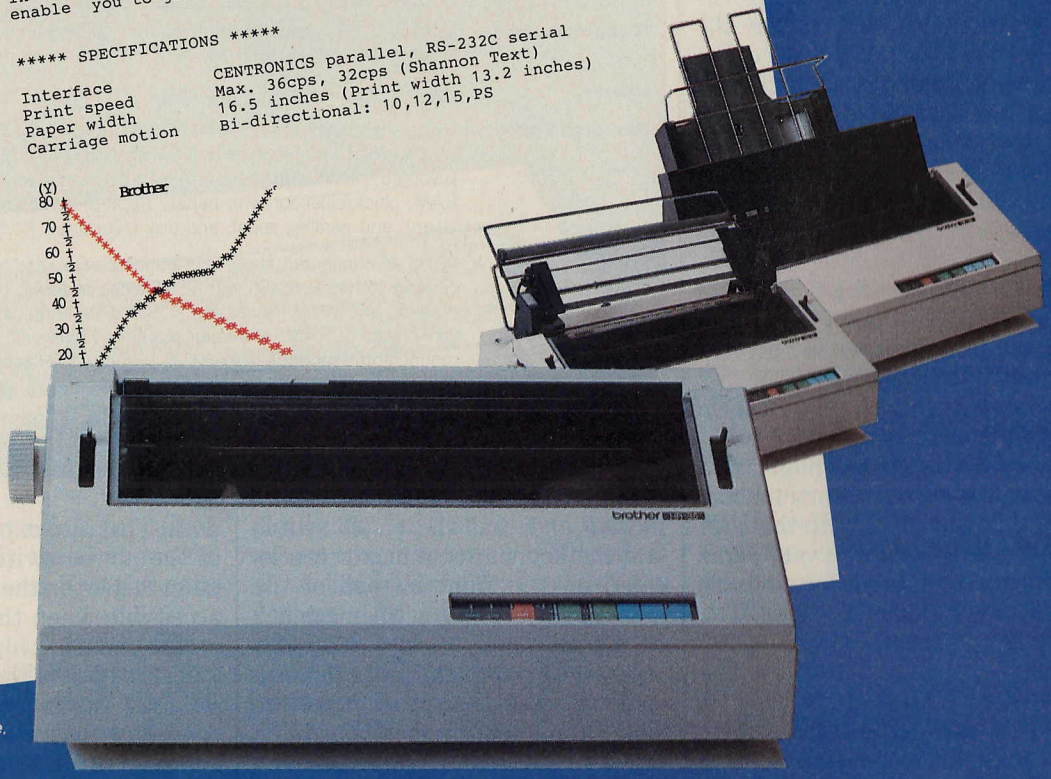
Paper width	16.5 inches (Print width 13.2 inches)
Carriage motion	Bi-directional: 10,12,15,PS



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The Leading Edge PC

Genuine enhancements make this computer stand out from the pack

by Lamont Wood

With computer vendors virtually diving under the table at the mention of the word "shakeout," your reaction to yet another IBM PC clone—a machine with an Intel 8088 chip, all the conventional hardware accouterments, and an MS-DOS operating system—may be a sad shake of the head.

But the Leading Edge Personal Computer has a lot going for it. For example, it incorporates design concepts that go beyond the IBM PC; it's being pushed through a massive advertising campaign; it's manufactured by Mitsubishi, the huge, well-respected Japanese consortium; and it's priced to compete with the IBM PC. You can also buy the very same machine in a slightly different guise from Sperry Corporation (see "The Sperry PC," page 106).

AT A GLANCE: Leading Edge Personal Computer System

Manufacturer:	Leading Edge Computer Products Inc., 21 Highland Circle, Needham Heights, MA 02194, (617) 449-4655
Uses:	Business and personal computing
Standard Features:	Dual-speed 8088 processor (4.77 and 7.16 MHz), two half-height, double-sided, double-density 5¼-inch floppy-disk drives, detachable keyboard, medium-resolution 14-inch color monitor, 256K bytes of RAM, clock/calendar with battery backup, seven expansion slots (three taken), and parallel, serial, and disk I/O ports
Price:	$2995 as configured above and bundled with Leading Edge Word Processing software; $2495 with 256K bytes of RAM, monochrome monitor, and Word Processing; $3995 with 10-megabyte hard-disk drive, 256K bytes of RAM, and color monitor; $3695 with hard-disk drive and monochrome monitor; also $2295 for entry-level system with 128K bytes of RAM and monochrome monitor
Documentation:	Operator's Guide/Technical Reference Manual, BASIC manual, MS-DOS User's Guide

The System Unit

The Leading Edge PC comes with 256K bytes of random-access memory (RAM)—128K bytes on the motherboard and 128K bytes on an expansion board that can be upgraded to 512K bytes for a total of 640K bytes of RAM (the same as the IBM PC). The hardware configuration is the standard one—a separate monitor, keyboard, and system unit box.

The first thing you're likely to notice about the system unit is that it's unusually large (18 by 16.5 by 5.3 inches) and that the on/off switch and the keyboard connector are located on the front instead of the more usual location on the machine's back panel.

But the system unit is large to accommodate seven expansion slots inside. One is for the disk controller, one is for the monitor controller, and a third for memory above 128K bytes. The four remaining slots are more than you get from a similarly configured IBM clone—or from IBM itself, for that matter. A high-resolution monitor and a hard-disk controller will each consume a slot, but even with those you'll still have two slots left.

The computer's size, though, isn't a major drawback because the unit can be placed on its side next to your desk. That also explains the location of the power switch and keyboard plug: they're on the front to be easily accessible when the system unit is on the floor.

On the back of the unit you find an RS-232C serial port and a 37-pin connector that allows the system to support two external disk drives that meet the ST506 interface standard. The RS-232 port is integral to the system, while the disk expansion port is actually part of the disk interface card, although this is not apparent from the outside. There is no integral parallel interface port, but it's easy and relatively inexpensive to add one with an expansion board. Inside the unit is an empty socket

Lamont Wood is a freelance writer who lives in San Antonio, Texas.

for an 8087 arithmetic coprocessor, which will greatly speed up mathematical computations, if you have the right software.

The half-height, double-sided, double-density disk drives are located in the right front of the unit, taking only as much space as one drive would occupy in the IBM PC. (Their exact capacity depends on the operating system—322K bytes for MS-DOS 1.25 and 362K bytes for MS-DOS 2.11.) The system can also use an optional hard-disk drive that doesn't crowd into the space needed for the expansion slots because it, too, is half height. (A hard disk requires a controller board, which, as noted above, takes up an expansion slot.)

The circuitry includes an integral clock/calendar that runs on battery power when the power is turned off so that MS-DOS already shows the correct date and time when you power up, and you don't have to reenter them every time—a nice convenience.

Software

The hardware comes with MS-DOS 1.25 and Microsoft's GW-BASIC, which is the disk-based version of IBM's chip-based BASICA. (I was told that MS-DOS 2.11 will soon be available from Leading Edge.) As for IBM compatibility, the usual test is Lotus 1-2-3, which does run on the system without difficulty. The only software programs likely to cause trouble are those with fancy protection features built in to prevent software piracy.

The evaluation unit came with a copy of the Leading Edge Word Processing software, a $100 package designed for IBM PC clones. I used it to write this review, and it seems to have all the basics—automatic page-footers and pageheaders, page numbering, boldfacing and underlining, etc. It doesn't display double spacing on the screen, and it doesn't put in page breaks as you go along—that requires a special command. Otherwise, what you see is what you get. However, some things (like string searches) move at a crawl, and the documentation straddles the fine line between user friendly and simplistic.

Pedal to the Metal

On the back of the unit, tucked in beside the serial port, is an eight-position DIP switch. Most of the positions control arcane technical functions, but position eight (the turbo switch) controls the processor's speed—4.77 MHz (the speed of an IBM PC) or 7.16 MHz (50 percent faster). This extra speed is possible because the Leading Edge PC uses the 8088-2 processor chip, a faster version of the 8088 chip used by the IBM PC.

In most cases, you can use the high-speed setting without causing problems. Expansion boards, for example, will work fine as long as any memory chips they contain can handle access speeds of 150 nanoseconds or better, and that's usually the case. Even time-critical software (like telecommunications packages) can handle the extra speed, because the bus continues to run at 4.77 MHz even when the processor and memory channel run at 7.16 MHz. (The bus is that part of the circuitry that serves as the central nervous system of the computer, connecting other components.) Keeping the bus at the lower speed also enhances IBM compatibility because most IBM software is designed for that speed.

I tried the turbo switch on two benchmark programs: a prime-number generator that tests raw number-crunching ability and a file

Photographs by Paul Avis

THE SPERRY PC: *A somewhat souped-up version of the Leading Edge PC*

With a few exceptions, the Sperry PC is virtually identical to the Leading Edge PC.

One of the exceptions is the way the Sperry PC is sold: it's being marketed almost solely by the Sperry field sales force to Sperry's existing customer base. If you want to buy just one, the company will direct you to a Sperry Productivity Center, a store-like direct-sales facility. Sperry has 53 of them.

Another big difference is Sperry's optional ultra-high-resolution, 12-inch color monitor and controller board (actually two boards connected by a ribbon cable, taking two expansion slots). It has a screen resolution of 640 by 400 pixels. In its high-resolution mode, it can display 16 colors, in medium resolution, 256 colors. Like the computer itself, the monitor and boards are manufactured by Mitsubishi.

The demo unit I received was dead on arrival; the controller board didn't work, and a replacement had to be sent. When it arrived, it turned out to be good stuff. It powers up in the same resolution as the medium-resolution system offered by Leading Edge. But you can put it in advanced text mode (try SCREEN 3,,,,2,,0,0 in BASIC) and it forms characters on a 7 by 12 matrix in an 8 by 16 cell. At this resolution I couldn't make out any dots—from a few inches away the text looked like solid printing.

With the medium-resolution system, when you print a character on part of the screen that already holds graphics, you blot out the graphics in that character cell. Likewise, putting graphics over text obscures the text. This is the way most computers mix text and graphics. But with the high-resolution system, text is printed on top of the graphics without otherwise altering them, like subtitles on a movie screen. This is possible because text and graphics are handled by separate screen buffers and because the board comes with a huge amount of dedicated RAM—192K bytes—devoted exclusively to the video display. (This RAM does not count as part of the system total.)

Why doesn't Leading Edge offer the high-resolution options? For one thing, no one there has a kind word for the physical design of the high-resolution controller board; it is, in fact, laced with dozens of delicate-looking, hand-soldered jumper wires. I was told that Leading Edge will offer the high-resolution option when Mitsubishi produces a more marketable version of the board.

Sperry counters this argument by pointing out that the board's jumper wires do not make it any less effective and that the problems I had with my controller probably stemmed from the demo unit's hard mileage (a reasonable claim). The failure rate for the unit is said to be less than 3 percent.

The only other noteworthy differences between the Sperry and Leading Edge PCs are in the keyboard and the documentation. Sperry added indicator lights to the Num Lock and Caps Lock keys, replaced the oversized plus key on the right side with an Enter key and a regular-sized plus key, as many clone makers do. The Sperry documentation does not include a technical reference section, which really isn't a problem unless you plan to do advanced programming. For most users, the nontechnical documentation will suffice. □

AT A GLANCE: The Sperry Personal Computer

Manufacturer:	Sperry Corporation, Computer Systems Division, POB 500, Blue Bell, PA 19424, (215) 542-4213
Uses:	Business and professional computing
Standard Features:	Same as the Leading Edge unit, except the standard Sperry unit comes with 128K bytes of RAM and 5, 4, or 3 expansion slots, according to configuration chosen
Price:	$2605 with 1 disk drive, monochrome monitor; $3030 with 2 drives, monochrome monitor; $3429 with medium-resolution color; $4158 with high-resolution color; $4865 with hard-disk drive and monochrome monitor; $5264 with hard-disk drive and medium-resolution color; $5993 with hard-disk drive and high-resolution color
Documentation:	Operating Guide, Guide to DOS, Programming in BASIC
Options:	IBM 3270 and Sperry UNISCOPE terminal emulation

handler that tests for overall speed, including input/output (I/O). Each program was run at both speed settings.

The increased speed showed up most in the number-crunching—an improvement of nearly 50 percent between 4.77 and 7.16 MHz, as you might expect. The file-handling benchmark showed only a 19 percent speed improvement, because disk I/O operates at the bus speed, not the processor speed. Still, 19 percent is nothing to sneeze at. (I also noted much less screen flicker on the color monitors at the higher speed.)

Looking at Monitors

The Leading Edge PC works with either a monochrome monitor or a medium-resolution color monitor. The 12-inch monochrome monitor has a green screen (amber is also available) showing the standard 25 lines by 80 columns. The characters are formed on a 7 by 9 dot matrix in a 9 by 14 cell—comfortably good resolution and, for prolonged viewing, easier on the eyes than the color monitor's medium resolution.

The medium-resolution color monitor has a 14-inch screen and a resolution of 640 by 200 pixels. It can display 16 colors in lower-resolution graphics mode (320 by 200 pixels). Characters are formed on a 7 by 7 dot matrix in an 8 by 8 cell. Specifications on this monitor are basically the same as those of IBM's high-resolution color monitor.

The Keyboard

Sad to say, Leading Edge stuck to the IBM PC keyboard layout. The key tops have a shiny finish, but otherwise there's nothing unusual about the look or feel of the keyboard. Many IBM clones have indicator lights for the Caps Lock and Num Lock keys, but the Leading Edge PC doesn't.

Documentation

The documentation has coherent discussions of things that often remain obscure, such as the use of the function keys in MS-DOS. The Operator's Guide also has a lengthy Technical Reference Manual.

Strangely, the MS-DOS manual devotes about 250 pages to the macro assembler, library manager, and cross-reference facilities, software utilities that don't come with the system and aren't even offered as options. More than one executive told me that these pages in the manual are a misprint, which must make it one of the longest on record. I was told that these sections would be dropped from future manuals and that anyone wanting the software should get the IBM version.

Larger Issues

The Leading Edge PC offers impressively high performance, compatibility, expandability, durability, and serviceability. But nowadays, the intelligent buyer has to look beyond the hardware to several broader issues.

One of them is service. Leading Edge has a toll-free help number. It also has signed up between 200 and 300 dealers who offer service and independent service technicians with stocked service depots. You also can get third-party maintenance contracts through Indeserv, an affiliate of American Express.

Another broad issue is the question of survival of the company. To compete, the clone makers have to be cheaper and better. Leading Edge executives say they can compete, because their supplier, Mitsubishi Electric, is in the big leagues and can build as cheaply as anybody. I also was told Leading Edge would match any IBM price change.

For the moment, Leading Edge seems to be doing just about everything right, offering computers with enough genuine enhancements to stand out from the pack. Whether it can continue to do everything right is another question—the road to you-know-where is paved with you-know-what, and IBM is capable of mowing down all clone manufacturers in its path.

So, if the lack of IBM initials on the case doesn't faze you, the Leading Edge Personal Computer may be just what you're looking for. □

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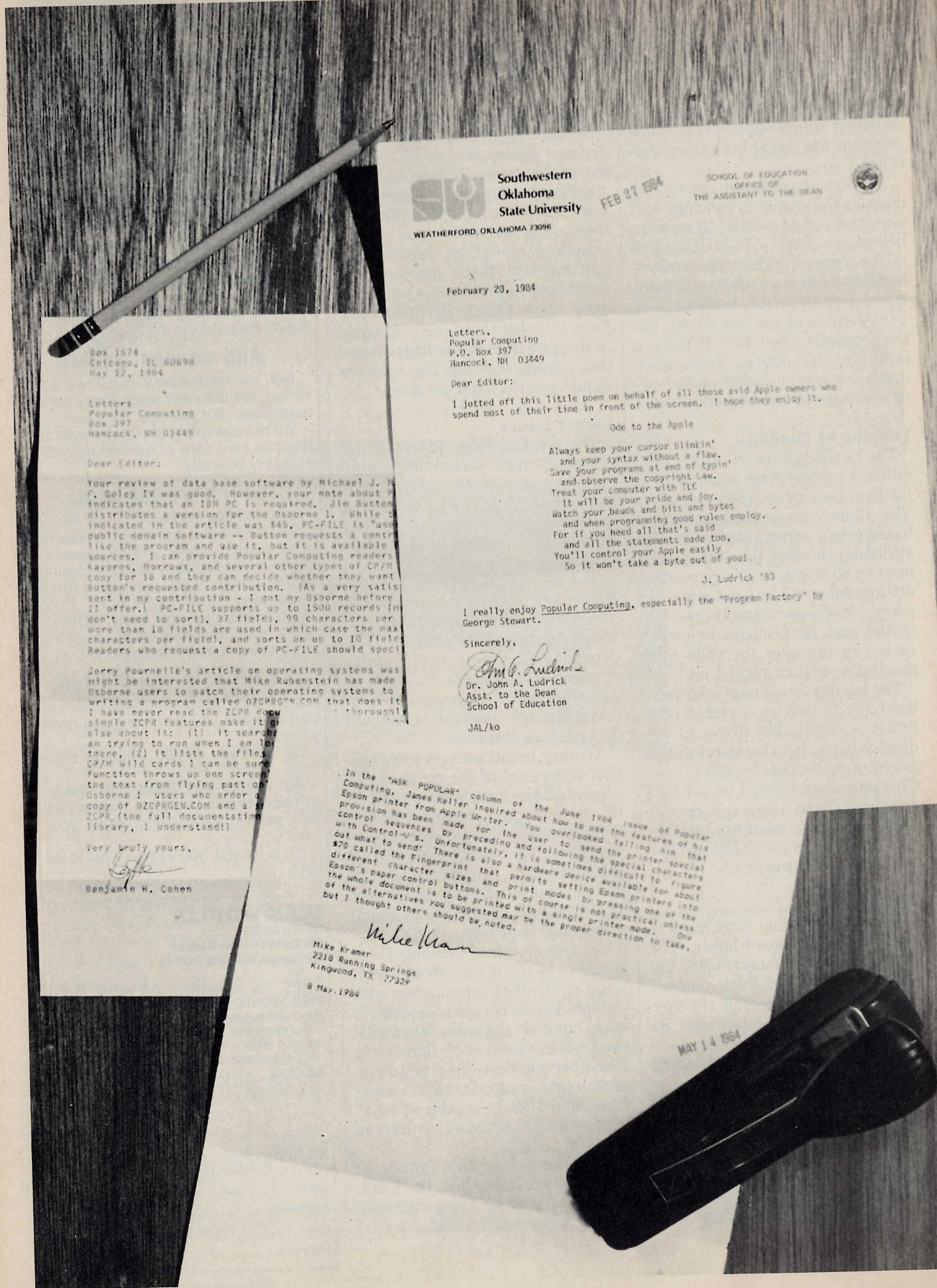

Box 1674
Chicago, IL 60690
May 12, 1984

Letters
Popular Computing
Box 397
Hancock, NH 03449

Dear Editor:

Your review of data base software by Michael J. M
F. Goley IV was good. However, your note about P
indicates that an IBM PC is required. Jim Button
distributes a version for the Osborne 1. While t
indicated in the article was $45, PC-FILE is "use
public domain software -- Button requests a contri
like the program and use it, but it is available f
sources. I can provide Popular Computing readers
Kaypros, Morrows, and several other types of CP/M
copy for $8 and they can decide whether they want
Button's requested contribution. (As a very satis
sent in my contribution - I got my Osborne before
II offer.) PC-FILE supports up to 1500 records (n
don't need to sort), 37 fields, 99 characters per
more than 18 fields are used in which case the max
characters per field), and sorts on up to 10 fields
Readers who request a copy of PC-FILE should speci

Jerry Pournelle's article on operating systems was
might be interested that Mike Rubenstein has made
Osborne users to patch their operating systems to
writing a program called OZCPRGEN.COM that does it
I have never read the ZCPR docu - thoroughly
simple ZCPR features make it g
else about it: (1) it searche
am trying to run when I am lo
there, (2) it lists the files
CP/M wild cards I can be sure
function throws up one screen
the text from flying past on
Osborne 1 users who order a
copy of OZCPRGEN.COM and a st
ZCPR (the full documentation
library, I understand!)

Very truly yours,

Benjamin H. Cohen

Southwestern Oklahoma State University
WEATHERFORD, OKLAHOMA 73096

FEB 27 1984

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OFFICE OF
THE ASSISTANT TO THE DEAN

February 20, 1984

Letters,
Popular Computing
P.O. Box 397
Hancock, NH 03449

Dear Editor:

I jotted off this little poem on behalf of all those avid Apple owners who spend most of their time in front of the screen. I hope they enjoy it.

Ode to the Apple

Always keep your cursor blinkin'
and your syntax without a flaw.
Save your programs at end of typin'
and observe the copyright Law.
Treat your computer with TLC
It will be your pride and joy.
Watch your bauds and bits and bytes
and when programming good rules employ.
For if you heed all that's said
and all the statements made too,
You'll control your Apple easily
So it won't take a byte out of you!

J. Ludrick '83

I really enjoy Popular Computing, especially the "Program Factory" by George Stewart.

Sincerely,

Dr. John A. Ludrick
Asst. to the Dean
School of Education

JAL/ko

In the "ASK POPULAR" column of the June 1984 issue of Popular Computing, James Keller inquired about how to use the features of his Epson printer from Apple Writer. You overlooked telling him that provision has been made for the user to send the printer special control sequences by preceding and following the special characters with Control-V's. Unfortunately, it is sometimes difficult to figure out what to send! There is also a hardware device available for about $70 called the Fingerprint that permits setting Epson printers into different character sizes and print modes by pressing one of the Epson's paper control buttons. This of course is not practical unless the whole document is to be printed with a single printer mode. One of the alternatives you suggested may be the proper direction to take, but I thought others should be noted.

Mike Kramer
2218 Running Springs
Kingwood, TX 77339

8 May 1984

MAY 14 1984

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This add-on brings IBM-compatibility to TRS-80 computers

by Thom Hartmann

We owners of Radio Shack TRS-80 microcomputers, particularly the newer Model 4 and the portable 4P, find ourselves in a strange sort of limbo. On the one hand, we have a well-built, smoothly operating computer, with a huge installed base of software from which to choose. The new Models 4 and 4P, with their 80-column by 24-line screens and compatibility with the earlier Models I and III, are particularly versatile, offering new operating systems and improvements on the old standby Radio Shack hardware.

The down side, though, is that the microcomputers from Tandy are all 8-bit machines using the Z80 processor and, as such, are hopelessly tied to what many consider to be the past. While it is true that the operating systems that run on TRS machines, namely CP/M, LDOS, and TRS-DOS, support a lot of available software, the inherent limitations of 8-bit systems (especially their inability to address more than 64K bytes of memory at any one time without resorting to clumsy tricks such as bank selection) have brought large-memory 16-bit systems—particularly the IBM PCs—to the forefront of software development. Programs with elegant databases and sophisticated, interactive spreadsheets are now taking the market by storm. And all are designed to run, or at least perform best, on the Intel 8088 or 8086 16-bit microprocessor chip, standard in IBM and IBM-compatible computers.

The reason these programs require a 16-bit processor is simple: they need more than 64K bytes of random-access memory in order to operate at maximum capacity. (Some use more than that just to load the program.) The availability of 128K-byte, 256K-byte, and even larger memories for microcomputers is, in fact, probably the single most significant factor that led to the development of many of the newer types of programs. It's what made them possible.

Now back to the TRS-80 owners. With the inherent limitations of the Z80 microprocessor, we've had to be content to sit on the sidelines and watch the development of all these fine new programs with their huge databases and giant file capabilities. The only option for a TRS-80 owner who wanted to run dBASE II, for example, was to toss the TRS-80 in the corner and shell out another three grand for an IBM-type computer, complete with an extra drive and a monitor. Or, rather, that was the only option until the development of the Micro Merlin.

This unimposing white box, which sits atop or next to a TRS-80 computer and is connected through a single plug to the expansion port on the underside of the computer (no disassembly or modifications to the computer are required), allows the elderly computer line from Tandy to run a large selection of IBM-compatible 16-bit software (see Micro Merlin Compatibility, page 112). You simply insert an MS-DOS or PC-DOS disk into the Radio Shack disk drive, close the door, and compute away.

Micro Merlin works this magic in a very straightforward manner—it is, itself, a 16-bit computer with 128K bytes of built-in RAM. It "seizes" the TRS-80 computer and uses it as a terminal. The keyboard, disk drive and screen are all brought under the direct control of the Micro Merlin.

While this approach makes for a seemingly simple solution to the IBM-compatibility problem for TRS-80 owners, the very simplicity imposes a new set of problems. The first of these concerns the screen. IBM-type programs that execute what is called a "direct video write" to the screen, where the screen is painted directly by the microprocessor itself rather than by a string of ASCII numbers sent to a character generator for display, simply won't run, or won't run properly, on the Micro Merlin. This is because under TRS-DOS, the only screen graphics available are those in the character-generation routine in the read-only memory (ROM), and these are confined to the creation of characters, blocks, and reverse video, as in a spreadsheet. This removes from consideration nearly all IBM-compatible

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software with sophisticated graphics or at least renders inaccessible the graphics component of the software.

But that still leaves a whole universe of other nongraphics-oriented software, including word processors, spreadsheets, and databases, which will make your TRS-80 behave in a very non-Tandy-like way.

IBM Compatibility

Like most IBM-compatible computers, the Micro Merlin isn't truly identical to an IBM PC, and therefore it won't run all of the software written for that machine. Of the three categories of IBM compatibility—operationally compatible, data-compatible, and MS-DOS-compatible—the Micro Merlin falls into the data-compatible genre. It operates under MS-DOS, will run many programs written for the IBM, and can read a stock IBM 40-track disk. It cannot, however, accept IBM peripheral cards (although this option may be offered in future upgrades of the Micro Merlin), and it cannot run IBM programs that use sophisticated graphics.

To resolve the graphics problem, Micro Projects Engineering, the manufacturer of the Micro Merlin, offers an optional IBM-type monochrome video card as an accessory. This card will enable the Micro Merlin to run much more of the IBM-type software, particularly that written with IBM direct video-write calls. With this new card, for example, the spreadsheet component of Lotus 1-2-3 will run on the machine, although the graphics component still won't work properly. For the video board to work, however, it must be attached to an outboard monitor, necessitating the investment of another $100 or more.

Model III/4 Compatibility

One of the most significant differences between Radio Shack's new Models 4 and 4P and the earlier Models I and III is the video screen size. While Models 4 and 4P have adopted the industry-standard 80-column by 24-line (80 by 24) screen, Models I and III use a 64 by 16 screen format. This makes for larger, more readable characters, which was Tandy's original thinking back when the only competition was the Apple II with a 40-character-per-line screen. But most software calls for a full 80 characters on each line, and that leads to problems.

On early versions of the Micro Merlin, Models I and III just wrapped around any characters unfortunate enough to fall past the 64th space on the screen. Menus didn't appear the way they should, spreadsheets became unintelligible, and entire pieces of the screen were scrolled off into obscurity.

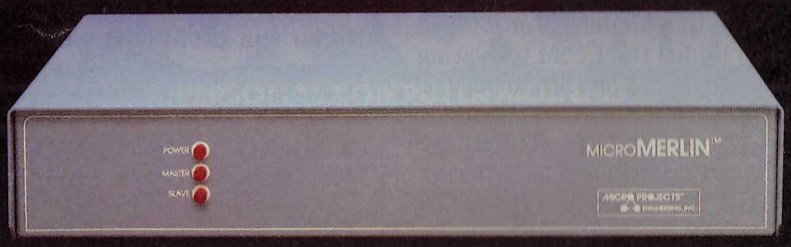
Micro Projects Engineering has recently solved this problem with a new software patch to the MS-DOS operating system, which provides for a virtual window for the I and III computers. Only a 64 by 16 window of the 80 by 24 screen is displayed, but you can move the window to see the entire screen. The 2, 4, 6, and 8 keys are designated by the software as "function" keys; pressing one of those keys while simultaneously pressing the "up arrow" key moves the window to the top, bottom, left, or right, respectively, of the 80 by 24 screen. So, while you're still stuck with a limited 64 by 16 screen, you can view and get information into and out of the full-sized screen area.

My only complaint about this approach is that you can't scroll the window in single-space increments; when you move the window, it goes all the way in whatever direction you've selected, abruptly jumping to the top, bottom, or right or left margin. You get used to it, but it's disconcerting at first.

It's with Models 4 and 4P, however, that the Micro Merlin really shines. Because these computers use a screen format similar to the IBM's 80 by 25, most programs (which don't require direct video write) look and work just as they would on an IBM or other 16-bit machine. Wordstar, for example, is one of the largest selling word-processing programs in the world. It will run on some 64K 8-bit machines, but it really shines when it has 128K bytes

AT A GLANCE: The Micro Merlin

Manufacturer:	Micro Projects Engineering, 3951 Higuera St., Suite B, Culver City, CA 90230
Uses:	Allows the TRS-80 and other Z80-based microcomputers to run 16-bit 8088- or 8086-based software (often IBM-compatible)
Standard Features:	Intel 8088 16-bit processor, 128K bytes of RAM, RS-232C serial port, Centronics-compatible parallel printer port, connecting cable and plug for Radio Shack computers
Documentation:	A thorough but highly technical 40-page user's manual plus user's guides and programmer's guides to CP/M-86 and MS-DOS
Options:	MicroMEM-64 memory expansion board, with 64K bytes ($275); additional memory in 64K-byte increments to 256K bytes ($99); MicroNPX Intel 8087 mathematics coprocessor and Assembler support ($325)
Base List Price:	$995 as configured above. This is also the typical system price.



of RAM to run around in. And it works just fine with the Micro Merlin. Another example is dBASE II, which also runs on the Micro Merlin; it alone may justify the cost of upgrading your TRS-80.

Micro Merlin operates under MS-DOS, will run many programs written for the IBM, and can read a stock IBM 40-track disk. It can't, however, accept IBM peripheral cards.

The biggest negative for me was the user's manual. It's written in technicalese and is laid out like an operator's manual for a mainframe computer. This is fine if you're a super-technical type, and maybe most people who buy the Micro Merlin are, but it would be nice if the folks at Micro Projects Engineering could put together a manual that the average computer user could read and understand, one that could be easily scanned for reference.

Other Functions

The Micro Merlin, because of its added memory capacity, can do more than just bring new software to Z80-based microcomputers. When connected to a Model III or 4 that's running under the CP/M operating system, the Micro Merlin can also be configured to run as a virtual disk, using an optional software package available from MPE. (The software does not work with TRS-DOS, though.)

A virtual disk is a large bank of RAM memory that the computer thinks is a disk. Since you can write to RAM in less than a thousandth of a second, whereas it takes several seconds for a disk to lay down information on a disk, using RAM as a virtual disk for programs that have frequent disk accesses will substantially speed up their execution. When you're all finished running the program, you simply give the computer a command to transfer the contents of the RAM "disk" onto one of the floppy disks in the disk drive.

Optional printer spooler software (which can work with either TRS-DOS or CP/M) also makes use of the Micro Merlin's extraordinary volume of memory by allowing the computer to feed into RAM the contents of a file or document to be printed, thus freeing the computer to go on about its computing business, while RAM slowly "spools" out to the printer.

At the time this review was written, the software for these two functions wasn't finished, so I didn't have a chance to check it out. Micro Projects Engineering assures me, however, that by press time, the software will be ready to ship.

In addition to these extra software features, the Micro Merlin has RS-232C and parallel printer ports mounted on the back of the box. Since you can call up, through software command, either the ports in the TRS-80 or the ports in the Micro Merlin, it's like adding a second pair of ports to your computer.

There's also an optional 8087 math coprocessor available for the Micro Merlin. This is a chip specifically designed for high-speed multiplication, division, addition, and subtraction—operations the regular microprocessor does in rather clumsy fashion. By plugging a math coprocessor into the machine, you can significantly speed up the computational abilities of the computer. About 20 percent of the people who buy the Micro Merlin also buy the math coprocessor, according to the manufacturer.

Micro Merlin Compatibility

What runs, what doesn't

Micro Products Engineering (MPE) has tested a number of software packages on the Micro Merlin; users of the Micro Merlin also have reported their experiences to the company. Generally, software that avoids the use of sophisticated or unusual graphics runs without problems on the Micro Merlin. This list shows the successes and failures reported as of early summer 1984.

Under the CP/M86 Operating System:

VENDOR	PROGRAM	STATUS
Micropro	Wordstar	Runs
Ashton-Tate	dBASE II	Runs
CI	C-86	Runs
Digital Research	CBASIC-86	Runs
Sorcim	Personal Basic	Runs
	Supercalc 1.2	Runs

Under the MS-DOS Operating System:

VENDOR	PROGRAM	STATUS
Micropro	Wordstar 2.2	Runs (Version 3.3 does not)
Microsoft	Multiplan	Runs
Microsoft	Windows	Doesn't run
Lifetree	Volkswriter	Runs, but requires 80 × 24 and has strange graphics
Supersoft	Fortran	Runs
R & R	Janus/ADA	Runs
Microstuff	Crosstalk	Doesn't run
Compuview	MODEM86	Runs
Lotus	1-2-3	Doesn't run
Visicorp	Vision	Doesn't run
Softrend	Aura	Doesn't run

For information on how other software runs on the Micro Merlin, contact MPE, 3951 Higuera St., Suite B, Culver City, CA 90230.

Other Computers

Micro Projects Engineering, a relatively small, 4-year-old company located in Culver City, near Los Angeles, plans to bring the wonders of 16-bit compatibility to other 8-bit microcomputers. A generic version of the Micro Merlin will be offered for around $1000, which will upgrade a Kaypro, Osborne, Morrow, Epson, or other Z80-based computer. The only caveat is that many of these computers don't have an interface bus like the one on the TRS-80; connecting the device to them probably will require some disassembly of the computers.

In addition, the company plans to offer a version of the Micro Merlin (called Xcalibur) that can be upgraded to run even graphics-oriented IBM software.

Only for Upgrading

The strength of the Micro Merlin isn't that it will make your TRS-80 into an IBM PC (which it won't quite do) but that it will give you access to up to 768K bytes of optional RAM and allow you to run 16-bit software. In this context, it's an excellent product that really does what the company says it will do.

But it's strictly an aftermarket product. If you already own a TRS-80 microcomputer and want to extend its abilities, the Micro Merlin is a good option. If, however, you're contemplating the purchase of a computer and think that buying a TRS-80 and a Micro Merlin together will give you an IBM-compatible computer at a low price, think again. The direct route of looking at other PC-compatible computers on the market, or even the IBM PC itself, would be easier on the pocketbook and much less hassle.

But for those people who have already bought Z80-based computers and are now frustrated by the limitations imposed by 8-bit bytes and 48K or 64K bytes of maximum memory, the Micro Merlin is a useful and relatively inexpensive option that can dramatically expand the number and variety of software programs you can use. □

"MY FAVORITE MODEM
is the X100 POPCOM from PRENTICE."
Mark Klein
Fall 1984 BYTE Guide to the IBM PC
"The POPCOM works well with practically any data communications program—from the simplest to the most complex."
Frank J. Derfler, Jr.
August 21, 1984,
PC MAGAZINE
"This modem offers extra features for 20% less than a Hayes Smartmodem 1200."
Steven Satchell
July 23, 1984, Info World
We couldn't have said it better ourselves.
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Sunnyvale, Ca. 94088-3544

The Panasonic Sr. Partner

Transportability, IBM-compatibility, and a built-in printer

by Thom Hartmann

The Panasonic Sr. Partner is a powerful, elegant computer that anyone with a minimum of computer knowledge and a modicum of determination can easily learn to use. It's a transportable, 16-bit, IBM-compatible machine that works right out of the box. There are no concerns about options or peripherals or "What else must I buy to get the thing to work?"

The Sr. Partner is designed and packaged for the mass market almost like a conventional home appliance. Panasonic is not yet distributing the Sr. Partner through the same network it uses for its stereos, televisions, and hair dryers, but it does not rule that out for the future. To me, the idea of an IBM-compatible computer so complete and ready to use that it could be sold in K-Marts and stereo stores is at least as interesting and exciting as the hardware itself.

Photograph by Paul Avis

And the hardware is impressive. Not so much for the individual parts but for the way they're combined in a marvelously integrated package. A single 18½- by 13- by 8-inch case houses the circuit boards, two expansion slots, a 9-inch high-resolution monochrome monitor, one 320K-byte 5¼-inch floppy-disk drive (with room for a second), a detachable keyboard, an RS-232C serial port, a parallel printer port, an RGB socket, and, most interesting, a built-in printer. Everything seems sturdy and well built, a fact reflected in Panasonic's one-year warranty (in contrast to the 30- or 90-day warranties offered by many manufacturers).

The Monitor

The Sr. Partner's built-in 9-inch monitor uses a medium-persistence green phosphor, which trades off between the strobing and flickering of some fast-phosphor screens and the smearing and trailing found in some slow-phosphor designs. The

AT A GLANCE: Sr. Partner Transportable Computer

Manufacturer:	Panasonic Industrial Company, One Panasonic Way, Secaucus, NJ 07094, 201-348-5200
Standard Features:	16-bit 8088 microprocessor running at 4.77 MHz, 256K bytes RAM, 16K bytes ROM, half-size 5¼-inch, 320K-byte, double-sided, double-density floppy-disk drive, 9-inch, high-resolution, green built-in monitor with 25 by 40 or 80 lines and 640 by 200 dot resolution (320 by 200 dot resolution on optional color monitor), 83-key keyboard, built-in thermal printer, RAM expansion slot, general-option expansion slot, parallel printer port, RS-232C serial port, RGB output port, software bundle including MS-DOS 2.11, Wordstar, Visicalc, PFS:File, PFS:Report, PFS:Graph, and GWBASIC; one-year warranty
Price:	$2195 as configured above
Documentation:	Owner's manual covering computer, MS-DOS operating system, and all included software
Options:	Memory upgrade to 512K bytes of RAM, second disk drive, most option boards (modems, clocks, etc.) made for the IBM PC

Thom Hartmann is a contributing editor of *Popular Computing*.

monitor displays 25 lines in either a 40- or 80-column mode. Graphics are displayed with a resolution of up to 640 by 200 pixels.

If you want to make use of the Sr. Partner's built-in color capabilities, it's a simple matter to connect an optional color monitor to the RGB cable socket on the back of the computer. (Color resolution is 320 by 200 pixels.) Or you can connect the Sr. Partner to a regular color television with a video adapter.

Keyboard, Memory, and Slots

The 83-key keyboard is laid out much like the IBM's, with the same old return-key- and left-shift-key-in-the-wrong-place problems. Similarly, there are no indicator lights for the Num Lock and Shift keys. But there are significant differences between the keyboards. The Sr. Partner's Enter key is a respectable size, but there is no keyclick (audible feedback that tells you when a keystroke has been entered).

The machine comes with 256K bytes of random-access memory and is expandable to 512K bytes. The supplied disk drive is a double-sided, double-density unit that can store 320K bytes. (An optional second drive is a good idea with most any computer, and the Sr. Partner is no exception: a second drive vastly simplifies operations such as duplicating disks, moving files, or swapping data from one application to another.) The Sr. Partner's drives write and read disks in the IBM format and seem to work reliably, although they make an obnoxious buzzing noise on access.

The machine's two expansion slots might seem inadequate, but keep in mind that, first, the Sr. Partner is a portable computer and space is at a premium, and second, several functions you'd need open slots for on an IBM are already built into the Sr. Partner. Also, if you want to go crazy adding things on, there are expansion-slot expanders on the market, which are to an expansion slot what an extension cord is to a wall outlet—plug one into a slot and immediately make available two or three more slots for add-ons.

The boards—and indeed, all the electronics—are cooled by a built-in fan that's not as quiet as some fans are. But keeping the close-packed innards cool, and therefore long-lived, is probably worth the small amount of fan noise.

Printer Pros and Cons

The built-in draft-quality printer is ideal for making quick notes or printing out rough copy, and it can be switched from an 80- to a 132-column mode. It's very quiet and virtually invisible except when in use, because it has a built-in cover. Even the paper roll mechanism is totally enclosed within the case.

The printer is a dot-matrix thermal type that works by applying pinpoints of heat to sensitized paper rather than by striking pins or a type element through an inked ribbon onto conventional paper. Thermal printing is quiet and requires few moving parts, but heat-sensitive paper sometimes makes poor photostats, may discolor over time or when exposed to heat, and is expensive.

You may want a separate, nonthermal printer to overcome the limitations of the built-in unit. Nevertheless, Panasonic made a positively brilliant marketing move when it decided to build a printer into the Sr. Partner. It's wonderful to be able to get rough drafts and quick copies without having to schlep around a separate printer. For routine day-to-day use, the built-in printer may be all you need.

No Software Shortage

In the fine old tradition of transportable computers, the Sr. Partner comes with its own set of software. This includes Visicalc, Wordstar, PFS:Graph, PFS:File, PFS:Report, and GWBASIC—a package representing a $1500 value—all at no extra charge.

In addition to these commercial programs, Panasonic also supplies some utility software with each machine, including a demonstration program that shows off the Sr. Partner's features and a dump screen utility that allows you to make a quick printout of whatever's on the screen. The dump works with text and with programs designed to drive a printer, but it falls down when printing graphics generated from BASIC. For example, the demo program has lots of pretty graphics but is written in BASIC, so if you try to do a screen dump, you only get whatever ASCII characters are on the screen—the graphics just come out as blank areas on the page.

The Sr. Partner can also use much of the software designed for the IBM PC. It has the same microprocessor chip—a 4.77 MHz Intel 8088—and has an open socket for an optional 8087 mathematics coprocessor chip to speed up number crunching. And the Panasonic designers seem to have taken great pains to insure compatibility. In fact, along with the computer, Panasonic supplies a list of the titles and publishers of software that will run on the Sr. Partner. Included are releases from Peachtree, Ashton-Tate, Lotus, IBM, MBA, Visicorp, Infocom, and others.

Documentation

The documentation with the Sr. Partner is generally first rate. There's an inch-thick book about the computer itself and the MS-DOS operating system, which starts, literally, at the beginning and works through to some pretty advanced functions. Additionally, there is well-written documentation for each of the programs that come with the computer. While anyone familiar with an MS- or PC-DOS system could instantly sit down and begin running the Sr. Partner, first-time computer users should allow time to read and experiment before starting any serious applications.

All in all, the combination of an unusually complete selection of supplied software *and* a built-in printer gives the Sr. Partner a leg up on the other MS-DOS-compatible transportables. It appears that Panasonic has a winner in its full-featured, inexpensive, rugged, and functional Sr. Partner. □

Yakity-Yak

Teletalker—a transportable computer with a voice

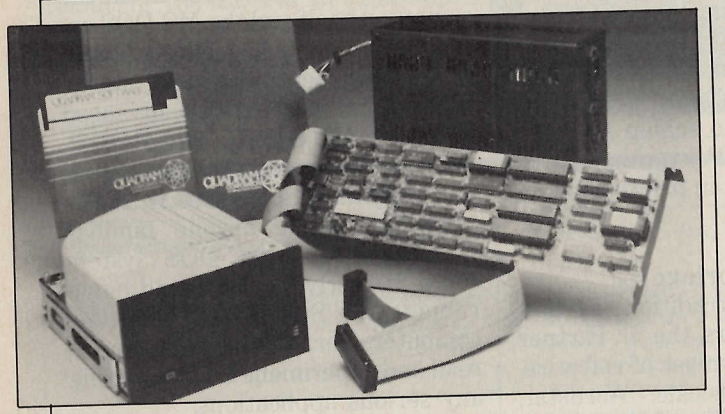
Centron has introduced Teletalker, a 26-pound transportable computer that offers a wide variety of voice-oriented features. Included are voice mail, electronic dictation, answering machine, and call-processing functions. Using a proprietary digital recording technique, the system can automatically answer a phone, take voice messages, and send verbal replies. The recording time exceeds that of a standard audio cassette.

Teletalker is based on Intel's 8088 microprocessor and offers MS-DOS compatibility. The system features two 5¼-inch floppy-disk drives (one a 360K-byte unit, the other a high-density, 3.3-megabyte drive), 256K bytes of RAM, an optional 10-megabyte Winchester drive, a 9-inch yellow-phosphor video display, RS-232C and parallel printer ports, and red-green-blue (RGB) and composite color video interfaces. Teletalker can be controlled from remote locations via Touch-Tone commands.

Other features include a Hayes-compatible 300/1200-baud modem, an auto-alarm with calendar, a hard-disk interface, and a sculptured keyboard with numeric keypad and 10 programmable function keys. It also offers sequential dialing of up to 50,000 telephone numbers and the ability to conduct a two-way conversation, recording only necessary information. The system is shipped with MS-DOS 2.1 and GW-BASIC.

Teletalker retails for $4995. For further details, write Centron Corp., 3200 North Hayden Rd., Suite 180, Scottsdale, AZ 85251.

Circle 200 on inquiry card.



High-Capacity Hard Disk

Quadram lets your IBM PC or compatible emulate an XT

Quadram Corp. has released an updated version of its 72-megabyte Quad Disk, a 5¼-inch Winchester-type hard-disk drive system that allows an IBM PC or compatible to fully emulate an XT.

Mounted inside the PC's second floppy drive slot, Quad Disk formats into two logical 31-megabyte partitions. The system uses standard DOS 2.0 or 2.1 commands, requires no external drives, and provides a 30-millisecond access time. The drive is well suited for use with local-area networks and multiuser systems. Included with Quad Disk is Wonder, a menu-driven utility file that eliminates the need to memorize complicated DOS commands.

Quad Disk, including controller card and power supply, retails for $6500. Complete details are available from Quadram Corp., 4355 International Blvd., Norcross, GA 30093.

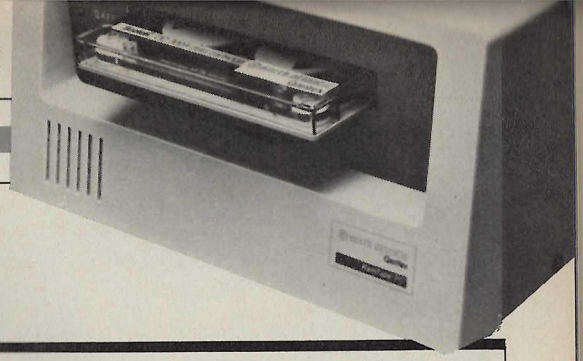
Circle 201 on inquiry card.

Total Control

Powerport lets your computer regulate home appliances

Powerport is a computer interface that can control up to eight electrical devices including household lighting, heating, cooling, and sprinkler systems. The $99 unit plugs into the user port of any Commodore 64 or VIC-20 computer. All output functions can be programmed in BASIC and stored in the computer's memory. The unit is shipped with either tape or disk scheduling software. For further details, write Saverg Inc., 1404 Webster Ave., Fort Collins, CO 80524.

Circle 202 on inquiry card



Ram Power

Ramtape PC—a triple-purpose memory peripheral for IBM PCs and compatibles

Qantex's Ramtape provides more than 10 megabytes of data storage on each ¼-inch tape cartridge, along with as much as 512K bytes of on-board RAM. Combined, this huge amount of memory can be used in any of three ways. First, the tape can be used to back up the hard disks of the IBM PC, XT, and similar compatibles. Second, because information on the tape is automatically separated into 30 disk images—pseudo-disks—you can selectively update portions of the tape instead of having to rerecord the entire 10 megabytes of information. Finally, the on-board RAM can be used as a disk emulator for very fast data storage and retrieval. Because this RAM is accessed through the I/O ports of your computer, it does not count as part of your machine's main memory, so you can effectively exceed your computer's maximum allowable RAM.

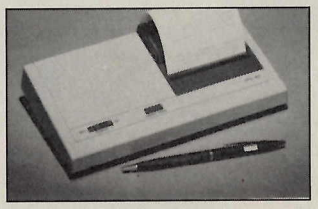
Ramtape PC is shipped with a plug-in host-adapter circuit card, cables, power supply, and a disk containing a variety of software drivers and utility programs. It is priced at $1995 (including 384K bytes of RAM) and $2295 (with 512K bytes of RAM). For more information, contact Qantex Division, North Atlantic Industries, 60 Plant Ave., Hauppauge, NY 11788.

Circle 203 on inquiry card.

Have Portable Printer, Will Travel

The Seiko DPU-40 thermal dot-matrix printer

Seiko Instruments has unveiled the DPU-40, a portable thermal dot-matrix printer that fits into virtually any available space and provides quiet, reliable operation. Priced at $124.95, the unit offers a print speed of 0.6 line per second and a 3-inch-wide, 40-column output. Other features include a 5 by 7 dot-matrix format, 96 ASCII characters, a Centronics-type parallel interface, an AC adapter, and a print head with a life of 500,000 lines.



The DPU-40 measures 8¼ by 4½ by 2 inches and weighs 14 ounces.

For more details, contact Seiko Instruments USA Inc., 2990 West Lomita Blvd., Torrance, CA 90505.

Circle 204 on inquiry card.

A Legend Is Manufactured

The Legend Model 880 dot-matrix printer

The Legend Model 880 is an inexpensive dot-matrix printer that offers switchable 80- and 142-column outputs and a print speed of 80 characters per second.

Other features include an 8-bit Centronics-type parallel interface, bidirectional logic-seeking operation, 228 ASCII characters, a push-button control panel, and a 9-wire print head. A square-dot printing method generates high-quality printouts and provides 40 different character fonts. The fonts are selectable in real time by the printer's host computer and can be mixed on a single line.

The Model 880 handles single sheets, 3-part Z-fold paper, and mailing labels. Paper width is adjustable from 4 to 10 inches. For complete details, contact Cal-Abco, 14722 Oxnard St., Van Nuys, CA 91401.

Circle 205 on inquiry card.

Watch QWERTY Quiver

A Dvorak-format keyboard for the IBM PC

Century Research and Marketing has unveiled a Dvorak-format replacement keyboard for the IBM PC. In addition to enhancing typing efficiency, the $149.95 unit also provides an IBM-style case, a built-in palm rest, adjustable support legs, and an improved tactile feel. Additional details are available from Century Research and Marketing, 10800 Normandale Blvd., Bloomington, MN 55437.

Circle 206 on inquiry card.

Disk Storage to the Third Power

The Cube—a new concept in floppy-disk storage

Looking for a safe place to keep those pesky 5¼-inch floppy disks? The Cube is an inexpensive storage console that safely houses up to 36 disks.

Priced at $29.95, the unit is formed out of molded plastic and supported by a rotating steel ball-bearing base plate. Each disk is stored in its own slot. Stenciled slot index numbers and a printed index card help keep your disk collection organized. The Cube is factory assembled and features a modest 9-inch footprint.

For complete information, write Information Concepts Inc., POB 462, Stone Mountain, GA 30086.

Circle 207 on inquiry card.

Choice Connection

Choice Data Switches let you mix and match computers and peripherals

Computer Datacom's Choice Data Switches enable you to switch between peripherals and computers without stopping to connect and disconnect cables.

Six different models are available that permit users to connect a computer to two or three peripherals or a peripheral to two or three computers. A serial version switches all 24 lines of an RS-232C interface. An economy model is available that switches eight of the most commonly-used RS-232C signals. Other models include a Centronics-type parallel interface, an RS-449 interface, and an IEEE-488 interface. Also available is a device that enables users of the IBM PC and compatibles to switch between printers.

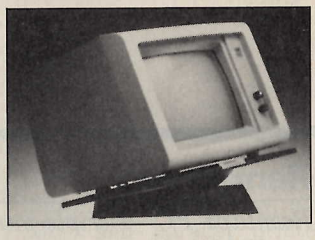
Prices of Choice Data Switches start at $99. More details are available from Computer Datacom Inc., 1821 McGaw Ave., Irvine, CA 92714.

Circle 210 on inquiry card.

PC Monitor Tilt

An ergonomic monitor stand

Omnium has introduced PC Monitor Tilt, a $29.95 tilt-and-swivel monitor base. Compatible with most popular monitor models, the unit is designed to maximize viewing comfort, reduce glare, and minimize the stresses and strains associated with monitor viewing. PC Monitor Tilt features a low-profile platform that tilts 20 degrees forward or backward and rotates 360 degrees with the touch of a hand. The unit is constructed out of high-impact plastic and requires no maintenance. More information is available from Omnium Corp., 203 North Second St., Stillwater, MN 55082.



Circle 208 on inquiry card.

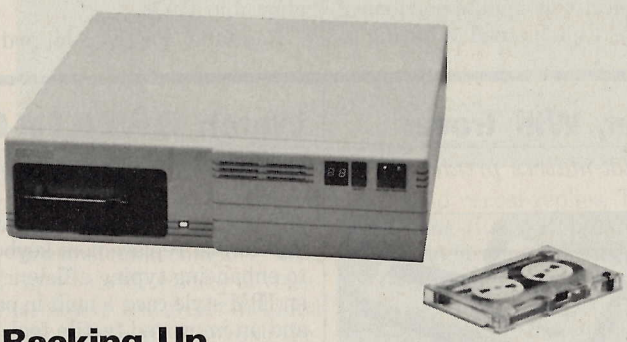
File by Color

NEBS introduces a color-coordinated disk filing system

NEBS Computer Forms' Diskette Envelope System helps you keep your floppy disk collection in order. The system enables you to create color-coordinated files for storage and retrieval.

The $14.95 package includes 50 disk envelopes (10 each of 5 bright colors), and 50 color-coordinated disk and storage case labels. Also provided are 20 write-protect tabs. For additional information, write NEBS Computer Forms, 12 South St., Townsend, MA 01469.

Circle 212 on inquiry card.



Backing Up

The Sponge—a tape-drive backup system for Hewlett-Packard computers

Bering Industries has introduced The Sponge, a $2380 tape-drive system for Hewlett-Packard personal and technical computers. The unit can independently back up an entire hard disk, eliminating the need for a software driver on the host computer. The Sponge can also emulate a hard-disk drive, providing full random-access capability plus a 20-megabyte formatted capacity.

The Sponge is designed for use with Hewlett-Packard Series 80 and 200 and HP-150, 120/125, 250, 98xx, and 1000 systems. The device is fully plug-compatible with HP-9134x-type disk systems or equivalents. Non-Hewlett-Packard computers with an IEEE-488 or HP-IB interface require special software drivers. More information is available from Bering Industries Inc., 1400 Fulton Pl., Fremont, CA 94539.

Circle 211 on inquiry card.

Tick a Lock

Stoplock IIR protects your computer systems from unauthorized use

Stoplock IIR is a plug-in circuit board that provides system security for your IBM PC (except model A units), XT, and 3270 PC, Tava, Compaq Plus, and Columbia MPC and XT.

Once installed inside your computer, Stoplock IIR uses up to 15 access codes and one master code to prevent unauthorized use of the computer. All codes are programmable. The Stoplock IIR package includes Softhold (a two-key combination that locks the computer and displays at any point in your program), Autotrail (an audit trail generator), and Stopdisk (a disk copy-protection system). Stoplock IIR sells for $495. For more details, write SDI Inc., POB 712, Lawrence, KS 66044.

Circle 209 on inquiry card.

Painting Power

The Digital Paintbrush System lets you create professional-looking computer graphics

The $299 Digital Paintbrush System is a combination hardware/software color graphics package for business and home.

Designed to operate with an Apple II Plus, IIe, or IIc, the system includes a high-resolution digitizing device that accurately transfers pen movements onto any color monitor or TV screen. Accompanying software includes a paint program, a text generator, a text screen editor, an electronic slide-show system, and a hard-copy printout program. A graphics telecommunications program enables two modem-equipped computer users to simultaneously create, edit, save, and print drawings in real time over telephone lines. For more details, write The Computer Colorworks, 3030 Bridgeway, Suite 201, Sausalito, CA 94965.

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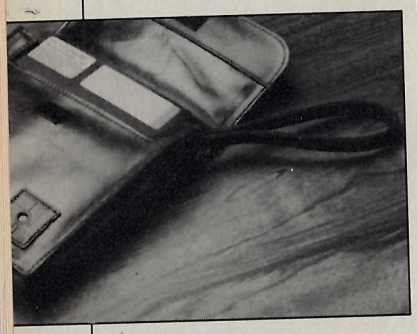
Executive Disk Tote

Looking for a stylish way to carry your 5¼-inch floppy disks? Made of soft cordovan leather, Executive Disk Tote holds and protects up to 12 disks in a lined pouch. The $49.95 tote has a Velcro clasp and a wrist strap. Additional



details are available from Microcomputer Accessories Inc., POB 3725, Culver City, CA 90231.
Circle 214 on inquiry card.

Passing the Bar

HBD-PC enters bar-code data into your IBM PC

HBD-PC is a bar-code interface package for the IBM PC and compatibles. The system's decoding circuitry is available with four-code coresidence and auto-discrimination, enabling users to scan CODABAR, Code 3 of 9, Interleave 2 of 5, or Universal Product Code (UPC) formats.

The system is available with both visible red and infrared illumination bar-code wands. Many choices of viewing apertures and cords are available as options.

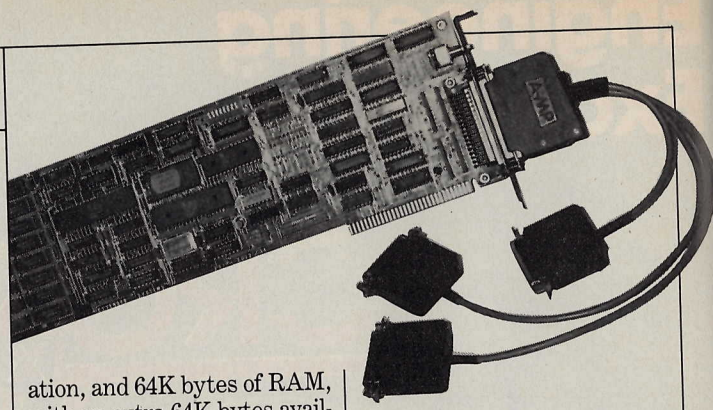
The HBD-PC system, which includes a plug-in circuit board, wand, and connecting cables, is priced at $595. For additional information, write Welch Allyn, Industrial Products Division, Jordan Rd., Skaneateles Falls, NY 13153.
Circle 215 on inquiry card.

Plotting Along

Shareplot extends plotter productivity

Shareplot, a plug-in circuit board for the IBM PC and XT, lets up to three computers (two may be non-IBM systems) share a single serial-based plotter. The device automatically buffers and manages graphics output, freeing the computers for other applications.

Priced at $595, Shareplot offers data transfer rates of up to 19.2K bits per second, completely transparent operation, and 64K bytes of RAM, with an extra 64K bytes available as an option. It supports most Hewlett-Packard Graphics Language-compatible plotters. The device is available in two versions: ESI-6012 Shareplot works with computers with Centronics-type parallel output, while ESI-6016 supports machines utilizing a serial output. Both versions have an external pushbutton switch and LED indicator.



Additional details are available from Extended Systems, POB 4937, Boise, ID 83711.
Circle 216 on inquiry card.

Super Duper

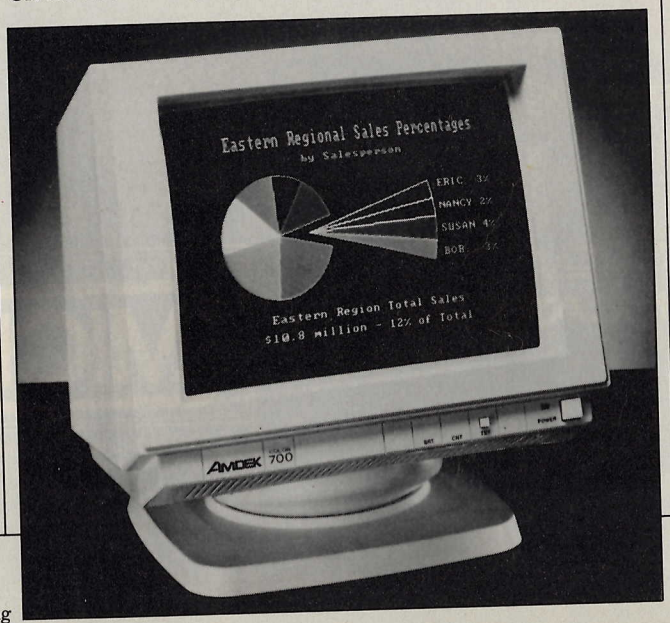
Amdek's new super-high-resolution color monitors

Amdek's new pair of color monitors work with both red-green-blue (RGB) and composite video signals. Dubbed the Color 700 and Color 710, the units provide a super-high resolution of 720 by 240 dots and the ability to display up to 16 colors.

Both monitors offer convenient, front-mounted operator controls, a black-matrix picture tube with a .31 millimeter pitch for easy-to-read text, and switch-selectable green or white text displays. In the text mode, each unit is capable of providing a 96-column by 25-line display. An optional ergonomically-designed tilt/swivel base stand offers users added viewing comfort.

The Color 700 is priced at $749. The Color 710, which includes a glare-reducing etched-glass display screen, retails for $799. The Color 710 also features a long-persistence phosphor coating that provides a greater vertical resolution (up to 480 dots).

For complete information, write Amdek Corp., 2201 Lively Blvd., Elk Grove Village, IL 60007.
Circle 217 on inquiry card.



Piggyback Card

Paradise Systems' Modular Graphics Card for the IBM PC and XT

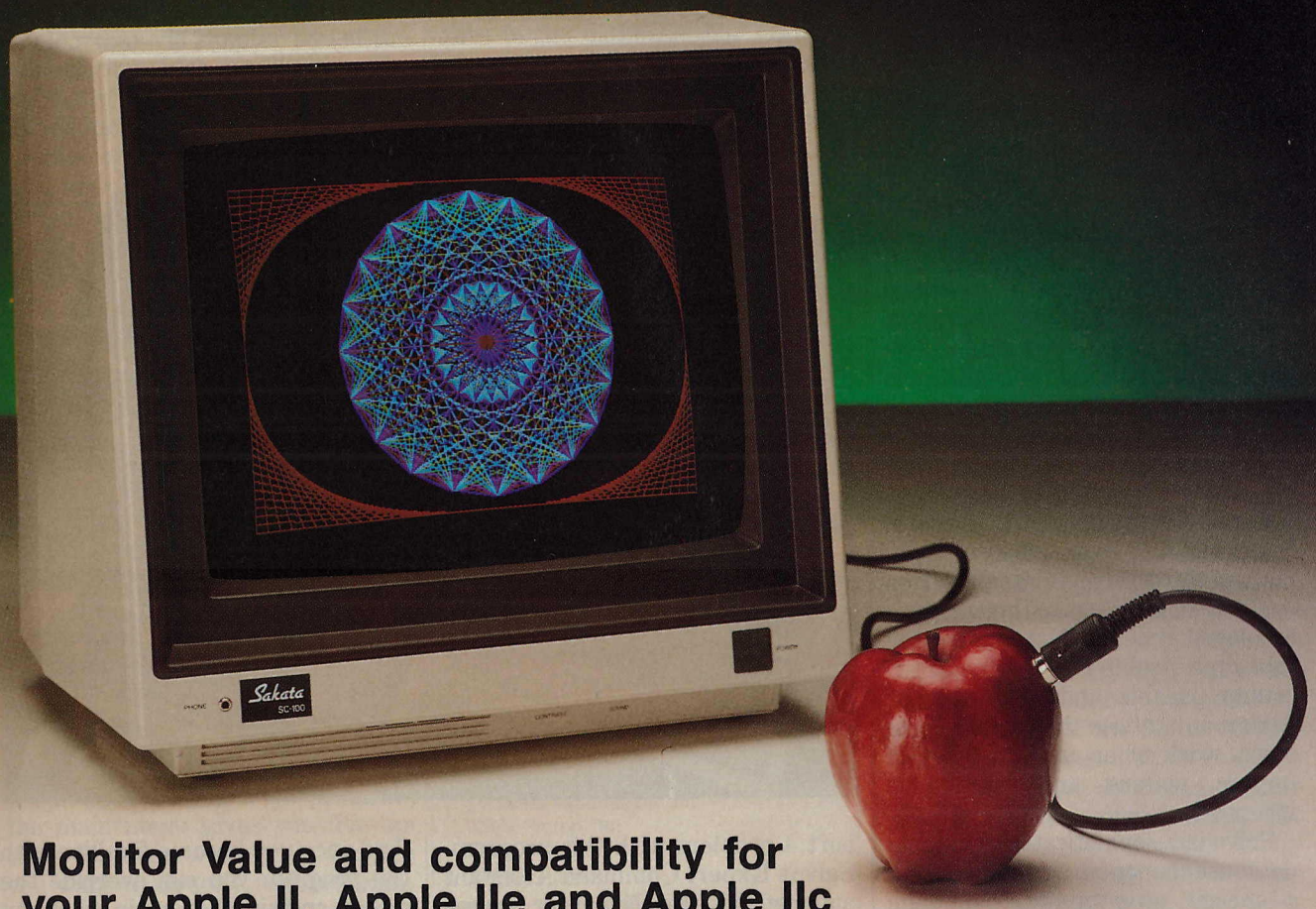
Paradise Systems has introduced the Modular Graphics Card, a plug-in color/monochrome graphics card for the IBM PC and XT. Unlike other graphics adapters, this device can be expanded in convenient increments.

The $395 baseboard card produces up to 16 colors on a color monitor or 16 shades of green, gray, or amber on an IBM or equivalent monochrome monitor using the monitor's full screen. The user can run any unmodified color/graphics software on a monochrome monitor while preserving the high-resolution monochrome character set. A $125 add-on piggyback provides a parallel, serial, or game interface.

An additional $275 module is available with 256K bytes of RAM plus a real-time clock, or 348K bytes of RAM, or a disk controller with parallel port. The Modular Graphics card, including add-ons, requires only a single PC expansion slot.

Additional details are available from Paradise Systems, 150 North Hill Dr., Brisbane, CA 94005.
Circle 218 on inquiry card.

THE SAKATA CONNECTION



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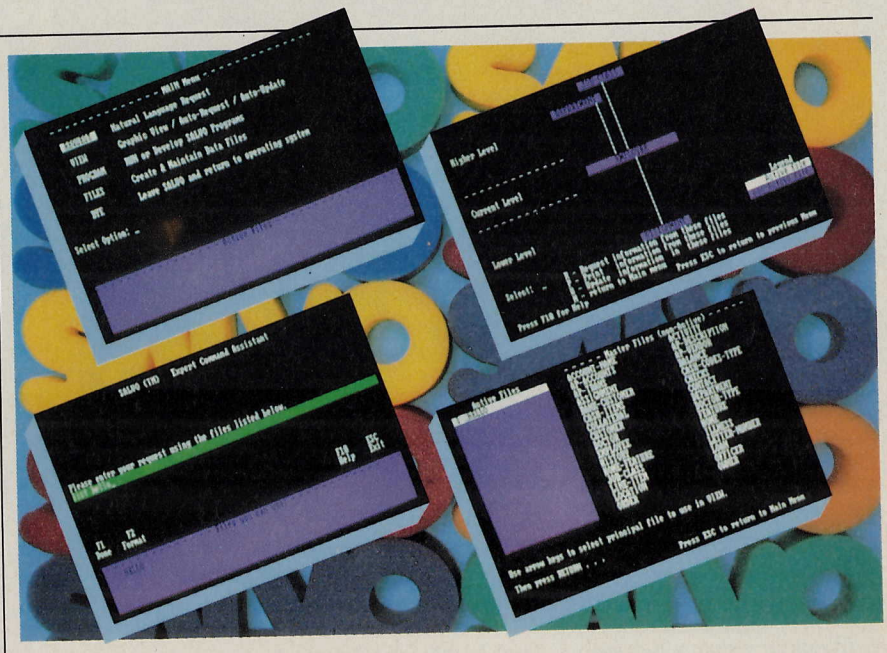
On AIMS/inquiry card 60

Salvo

Easy-to-write programs simplify searches with this database manager

by Joel C. Don



The way database programs sprout to life every week or so, you almost need a file manager to keep track of them all. Salvo is a newcomer that's bound to cause more than a few leaves to rustle in this congested forest. A sophisticated and powerful yet easy-to-use database management system, Salvo can tackle all kinds of data-management projects ranging from a simple mailing list to thousands of employee records. You could keep tabs on a sizable ledger of your accounts payable and receivable or design a database that would make short work of an unwieldy list of buyers, sellers, and warehouse inventories.

Salvo is a sophisticated relational database management system with a special programming language that makes it easy for you to query your database in complex ways with English-like command statements.

A relational database stores information in a number of different files that are related to each other in ways that you determine. Each file contains records, and each record contains fields. You might have a Customer file composed of one record for each customer. Information specific to each customer, such as Last Name, First Name, Account Number, etc., is contained in fields in each record. And although the structure of the database may seem involved, getting information out isn't a problem with this program. Salvo's Expert Command Assistant automatically translates your queries into code that the main program can understand. You phrase your queries in Salvo's English-like fourth-generation language (which has its own structure, verbs, and operators). Using its commands, you can directly retrieve data from your files, or write and store programs to perform data searches for you.

Salvo, which stands for Software Automation Language VOcabulary, guides you through all operations with its exquisitely structured menu format. The return and arrow keys will comfortably steer you through everything, helping you create and explore files with unbridled ease. And once you become familiar with the program you can override the menus and simply type in what you want to do.

You'll find the clearly written 300-page manual a welcome companion when you're designing your own custom data-request programs, but otherwise you shouldn't have any real need to keep it close at hand. If you get stuck, you can check any of the numerous on-line help screens. And if you have any questions not covered in the manual or in the on-line help screens, you can call a toll-free number for technical support.

Salvo can work with other applications programs. You use the Export

Joel C. Don is a Santa Ana, California-based writer who specializes in science and medicine.

Photographs by Ed Crabtree

and Import functions to exchange information between Salvo and other software through a standard called the Data Interchange Format (DIF). Among some of the packages that'll cooperate with DIF are Lotus's 1-2-3, Visicalc, TK Solver, Compuserve, and PFS:Graph.

After you load Salvo into your computer, you can take a Hands-On Guided Tour via chapter two of the manual, in which you'll learn the basics of maneuvering through Salvo's menu screens and executing various options. You can perform some simple database searches with sample files demonstrating the relationship between customers, sales representatives, parts, order numbers, and suppliers. As well, the 18-page tutorial shows you what a program looks like and how to run it. For practice, you can execute a program called Amount-Owed that computes money due from each customer. Your tour is a short one because you don't really need much hand-holding with Salvo's manual. (Mentioned but not fully described in the manual, are many other sample files and programs on the data disk that show various database applications for a number of mock businesses.)

Getting Going

When you first boot the program, the main menu gives you five options: Request, which you use when you want to directly retrieve information from your database; View, which shows you a diagram of how your files are related, and which you also use to retrieve information from your files; Program, where you write the programs for automatically retrieving data from your files; Files, where you create and delete files and manipulate the file structure (as opposed to file content); and Bye, which gets you back to the operating system.

When you first start using the program, you'll have to set up your database, which involves organizing records, creating and defining relationships between files, and entering data. Creating a data file is straightforward and, dare I suggest, fun. You choose the Create option from the Files menu to get into the files-generating mode. Next you name your file, and the program asks you if that file is related to any other file. If it's the first file you're creating, you have to say no. In the other event, you tell the program how the file you're creating relates to other files in the database. For example, you might want to relate a Customer file to a Sales Representative file. Each file name is shown in a rectangle and lines going from one rectangle to another show how the files are related. The relationships you define among the 16 active files that Salvo can work with at once are important for various file-management activities. Each file can have 32,000 records.

Next you must define your field names, such as Last Name, Account Number, Billing Date, etc. The number of allowable fields is based on a maximum of 1020 characters per record. Salvo presents a field-description chart in which you list the field name, data type, length, key type, whether you want this field to appear in reports, and a prompt heading for data entry and reports. Field names can be up to 20 characters long. Data type tells Salvo whether it's dealing with letters, numbers, monetary values, or dates. Keys give uniqueness to fields for sorting and data searches. You designate a primary, alternate, partial, or foreign key (or no key) for each field. The primary key is given to the field that you'd be sorting most frequently. For example, in a Customer file, the primary key would very likely be Last Name. By further refining the search criteria, alternate, partial, and foreign keys represent additional ways you can enhance Salvo's ability to search for a record or collection of records according to specific requests.

Salvo's extensive use of the IBM PC's function keys helps you edit text and define relationships while you're creating a file. For example, F10 displays a help screen describing the Create mode. F9 calls a help screen that describes the field item where the cursor was last located.

Once you're satisfied with the fields you've defined, you press the Escape key and the file is verified and added to your disk. If you don't like what you've done, you can use any of the four options from the Files menu to make changes. Revise allows complete modification of a file and its relationship to other files. Listable is a scaled-down version of Revise. Rename and Erase do as their names suggest.

Entering Data

Salvo has an interesting system for data entry. If you've ever wanted to tinker with record information without making the changes permanent, you'll like this feature. Salvo keeps all your files stored on a Master list; these files are referred to as nonactive. To make any changes or additions, or to conduct a search, you must make temporary copies of the files, transferring them into what's called an Active list.

At a Glance

Name: Salvo, Version 1.1

Type
Database manager with programming language

Manufacturer
Software Automation Inc.
14333 Proton Rd.
Dallas, TX 75234
(214) 392-2802

Price
$495

Format
Two 5¼-inch floppy disks

Computers
IBM PC and compatibles with 128K bytes of memory, Data General Desktop Generation, DEC Rainbow, Dimension 68000, Eagle PC or 1600, Fujitsu Micro, Kaypro-10, Hewlett-Packard 150, NCR Decision Mate, TI Professional Computer, Toshiba T-300, and Wang Personal Computer

Documentation
300-page manual with tutorials and demonstration files

Audience
Anyone who requires a database that is easy to query using English commands

When you shuffle Master files to the Active list, you have to set up the files so that changes will be permanent or temporary. Basically if you designate an Active file as "Included," any changes or additions will be recorded on your Master copy. On the other hand, you could designate a file as "Extracted," in which case you can experiment with record data without affecting the original version still tucked away on the Master list.

Extracted files can be thought of as working copies. If you make a lot of mistakes in a file, you can hold on to the original version with the Remove command. When you use Remove, the file name reappears in the Master list, but none of the changes are recorded. But if you decide you really want to permanently store changes made in an Extracted file, Salvo provides a command called Save to transfer the updated information to the copy on the Master list.

It's easy to move files from an active to nonactive state and vice versa. First you select the Active command in the Files menu. The right half of the screen then displays a listing of all your nonactive files. On the left is an inverse video box that is used as a reception area for the transfer of files to an active state. You choose a number from a comprehensive list of options at the bottom of the screen for including or extracting a single file or several related files at once.

As I mentioned above, a file must be in an active state for you to be able to add data to it. When you want to add information to your files, you use the Update function from the Request option in the main menu. (Update also lets you modify and delete data in existing files.)

Once you select the file or files to be modified, records are displayed along with a menu of function-key commands. The commands allow you to add or delete records or change any field values. The manual needs its own update here because it's missing an adequate description of several function keys, though you could figure them out by trial and error without too much difficulty.

Retrieving Information

Salvo gives you three ways to retrieve data from your files. The easiest method is accessed through the Main menu's View command, which calls an automatic program generator. Called Auto-Request, this feature lists in vertical format the contents of any and all of your active files. When you select Auto-Request, the program shows you your related files on-screen and then asks which files you'd like in your search statement. As you select files for your search, the program automatically writes a request command that includes all the chosen file names. Hit the F1 key and your Auto-Request program is executed. At this point, any file editing you may want to do is accomplished using the Auto-Update command.

Your second search option involves writing your own natural-language requests. You select Request from the Main menu and Salvo presents three lines for you to fill with your request text. The List command gives you a vertically formatted list of your records and Display produces the same information in horizontal format.

Your request can be quite specific. For example, you might say List Employees Where Salary > 30000 and Hiredate >= 01/01/80. Employees, Salary, and Hiredate are all field names. List is one of the many verbs the program recognizes, "where" is one of the structure components of Salvo's language, "and" is one of the logical operators, and > and >= are two of the comparison operators. This statement produces a list of people who make more than $30,000 and were hired after January 1, 1980. Or you might request pricing information on a product by typing List Products Where Price * .20 is < 10. (* is the symbol for multiply.) You can use symbols for the comparison and numeric operators or spell them out so that, for example, >= could be written out as Greater Than or Equal To and 6/3 is the same as saying 6 divided by 3. Salvo is smart enough to ignore words such as "my" and "their." And if you type a word not in the program's dictionary, you'll be prompted to make the appropriate correction. You can also use the Auto-Update in this mode for file editing.

Write Your Own Program

Your third option for retrieving information is to write your own programs. If you're going to go to the trouble of repeatedly writing out long requests, you might as well write and store them as programs. It takes a little extra time to create, but having your requests stored in a program is more convenient in the long run and also gives you considerably more data-search power because a program can have up to 14 lines and a maximum of 1008 characters. (Salvo also allows designation of a mini-program called a Phrase, which has a 72-character maximum length and saves data disk space. Phrases and programs are equivalent in function, however.)

To write a program, you select the Program option from the Main menu and highlight New in the Program menu to develop your search statement. You compose a program on a blank screen with the aid of function key commands for editing and retrieving data from your files.

Programs can take advantage of more than 70 different commands. You choose information you'd like from your files and write your program in simple English. There are no line numbers to contend with; it's just like using a text editor to write a document. And here's where the function keys come in handy.

The F9 key is my favorite companion for program construction. It's called the List/Pick function and it offers full access to files, fields, and record information. Tap F9 once and you get a list of files labeled A through Z in a menu box below the program-editing area. Instead of typing the file name when needed for a program statement, all you have to do is highlight the program name, choose the appropriate letter

label, and the name is written for you. Tap F9 again and a list of fields from the file appear. Hit F9 once again and you'll receive individual record information. The other function keys take care of useful editing functions. F5 and F6 allow you to place text in a hold buffer and insert it when you need it.

Programs generally begin with the word "by" and conclude with "end-by." For my employee files, a rather simple program for salary and hire date information looked like this: by Employees Where Salary > 22000 and Hiredate > = 2/20/76 list Lastname Firstname Salary Hiredate end-by. This gives me a list of names, salaries, and hire dates where incomes were greater than $22,000 and people were hired on or after February 20, 1976. Your programs can be much more specific. Files are normally sorted by your selected primary or partial keys, such as a last name or date. But you can also add the Sorting verb before a field name in a program to sort any selected group of records either alphabetically or numerically. The Input and Accept statements are particularly useful for providing data-entry prompts when you run a program. For instance, you could have a program prompt you with the question "Which employees earn more than ___ per year?" You would enter a dollar figure and the program would continue to run based on the value entered. If-Then statements can change the path of a program so that a program can take several routes based on data input. Store is a valuable feature that permits a single value to be recorded into several records at once. The Add statement can be used with Store to combine field values, either by the summation of numbers or joining of characters.

Files can be made active or nonactive from a program, which saves time if you don't want to use the menu options. Likewise, you can create a program that allows you to quickly update, add, or delete files. You may want to delete all records in an employee file where salary is less than $10,000, for example. Naturally, you can easily perform simple operations such as Count the number of records in a file, or Total field values.

After you're finished writing a program, Escape saves it in a special file on the data disk. You are also immediately presented with a menu-options list to run, edit, copy, print, or delete your just-written program. The run option is especially helpful at this point as a means of quickly checking your program for bugs.

Printing

Using your printer with Salvo is a snap. If you want a quick printout of file data, just use the Print command in a Request statement. There are three ways to have data printed in a report format. You can type Format from a Request statement or select "P" after you've entered the View menu. Either way, before your data is printed, you are presented with a screen of report-design options. You can have centered headers (a report title) and footers (text at the bottom of a report) on each page and include the date and page number. You can also specify form width and length. What's more, you can request formatted information to be displayed on your screen or stored on disk, though the default setting is for your printer.

The third method for getting a printout is to include Output-to-Printer in your stored program. But instead of viewing a menu of design options, you must use commands such as Skip, Page, Space, Form-Width, Form-Length, Indent, Page-Footing, Page-Numbering, Report-Title CR (carriage return), and Report-Date to design a form. It requires slightly more effort, since you have to do more than fill in the blanks as with the first two options. But once you've written a report format, printouts can be generated automatically every time you run a program.

Salvo is graphically stunning as a result of its extensive application of inverse video, flashing characters, and well-designed screen layouts. It's a program I'd recommend for serious users and hobbyists who don't mind the $495 price tag, especially if you'd rather let your manual gather dust on some bookshelf. Salvo is responsive, easy to use, and flexible enough to manage a hefty collection of records. Its programming language makes it easy for you to manage your files and retrieve information. Salvo is for both newcomers willing to try something different and old-timers who crave something better. □

BUSINESS

Supercalc 3

A graphics module and a database manager add versatility to Sorcim's electronic spreadsheet

by Patricia Johnson Swersey

Supercalc 3 is a relatively new player from one of the old-timers in the software business. Sorcim/IUS Microsoftware (formerly Sorcim Corporation) brought out its original spreadsheet, Supercalc, back when Visicalc first lit up video screens in rows and columns. Supercalc 2, which came out just about two years ago, updated the original spreadsheet.

With Supercalc 3, Sorcim not only further improved the spreadsheet but also enhanced the program with a full-featured graphics module and a database manager. The graphics program lets you display information in easy-to-understand charts and graphs yet does not require a color monitor or graphics adapter card.

Patricia Johnson Swersey is the editor of Spreadsheet and Omnicalc newsletters. She is also a consultant on microcomputer training and spreadsheet-model development for business clients.

The database manager, though lacking advanced built-in functions and capabilities, nevertheless does a good job storing data from your spreadsheets and then extracting, sorting, and finding that data according to criteria you select.

While Supercalc 3 got off to a good start, Sorcim/IUS has not been idle. The newest version of this program, Supercalc 3 Release 2.0, offers some significant improvements over Release 1.0. Most notably, Release 2 operates much faster, has increased math capabilities, and takes advantage of the power of the 8087 math coprocessor chip. (Hereafter "Supercalc 3" refers to "Release 2.0.")

Reliable and relatively easy to work with, the new Supercalc 3 can analyze financial problems, keep accounts in order, make graphic presentations, or manage data in personnel records. Supercalc 3 is a logical choice for people already familiar with the other Supercalc programs. Supercalc 2 owners can upgrade to Supercalc 3 Release 2.0 by sending Sorcim $100 plus the label from their Supercalc 2 disk (which means they actually have to cut off the corner of the disk, rendering the disk inoperable) plus $2 for shipping. Release 1.0 owners can upgrade to Release 2.0 for $50. (Supercalc and Supercalc 2 are still on the market.)

Sorcim products generally come with first-rate documentation, and Supercalc 3 is no exception. Written clearly and logically with good illustrations and step-by-step instructions, the manual gives you all the information you need to understand and operate the program. One feature I particularly like about the manual is the way it speaks to both beginners and those experienced with computers.

The First Steps

Getting started with Supercalc 3 is a fairly painless experience. The tutorials in the manual will have you up and running in about an hour or so. If you're a very fast study on the computer, you can be using Supercalc 3 in 10 minutes by going through the "Ten Minutes to Supercalc 3" tutorial booklet that comes with the program. You won't be an expert yet, but you will have a feel for what this program can do.

Supercalc 3's on-line help is in the form of an Answer Screen. If you have a question about what's going on in the program at any time, all you have to do is hit the question-mark key or the F1 key on the IBM PC to get the Answer Screen. The level of help you receive depends on what you're doing when you ask for assistance. For example, if you have just entered a slash (/) to call the command menu but can't remember what the symbols stand for, the Answer Screen will display all the command symbols and what they do.

Supercalc 3 comes with a program disk and a utilities disk (which, among other things, will let you translate files from other data sources).

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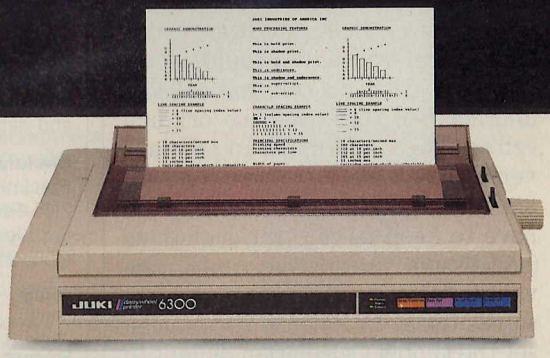

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Supercalc 3, like other spreadsheets, lets you enter data and then create formulas to manipulate this data. You can structure your data in any design that conforms to the standard row and column format. Release 2 can support up to 127 columns and 9999 rows. When you boot the program, it determines the amount of memory you have available for your spreadsheet and automatically assigns boundaries. Generally, with at least 192K bytes of random-access memory (RAM), you can work with the medium-range spreadsheet boundary of 127 columns by 2000 rows. If you have less than 192K bytes of RAM, your maximum spreadsheet size is 63 columns by 254 rows, which was what Release 1.0 supported.

Supercalc 3 gives you a high degree of flexibility in setting up your spreadsheet. You can enter labels, values, and formulas at any location in any order. The Natural Order Calculation mode with its Iteration and Solve features gives you a great deal of power. Using a process called circular reference, you could set up a model that has a cell that calls on another cell that uses the original cell's value in a formula. In previous versions of Supercalc and in Visicalc and Lotus 1-2-3's regular mode, you'd have to keep forcing recalculations (successive iterations) until the values "converge" and the problem solves itself. In Release 2.0 you can set the Global Calculation default to Iteration, and the program will automatically recalculate the circular reference cells until they converge.

Supercalc 3's execution of the Iteration feature is impressively fast. As a test, I set up a small spreadsheet with one circular reference. Only one number has to be entered in this spreadsheet and all the other formulas will be calculated. I entered a value for Sales in cell C1. I put Expenses, which were 70 percent of Sales, in C2. I entered Gross Income as the formula Sales minus Expenses in C3. At C4, I entered the Profit Sharing formula, which was 10 percent of Net Income. In C5, I entered the formula for Net Income, which was Gross Income minus Profit Sharing. As you can see, the circular reference occurs when the Profit Sharing formula calls on Net Income and the Net Income formula calls on Profit Sharing.

I ran the same test with Lotus 1-2-3, and Supercalc 3 in iteration mode came up with the solution just as fast as 1-2-3 in iteration mode. The only difference was that I had to turn off 1-2-3's iteration mode when the problem was solved; Supercalc 3 automatically shuts off the recalculation feature when the answers converge. Both programs operate about six times faster using the iteration mode than they would if you manually forced the recalculations.

Supercalc 3's use of the Intel 8087 math coprocessor chip greatly speeds up operation, especially if you make extensive use of exponential calculations in math-intensive models. The vast increase in speed is due partly to the fact that Supercalc 3 uses binary mathematics for calculations as opposed to the Binary-Coded Decimal system, which sacrifices speed for a more accurate representation of decimal numbers.

Some of the more complex built-in functions allow you to write conditional logic statements; for example, if some condition is true, then one value is returned, and if the condition is false, a second value is returned. A formula like this opens up a range of options for building spreadsheets that will produce alternative results given different base assumptions. Other built-in functions include a random number generator; a standard deviation function; a payment function, which allows you to determine the amount of yearly or monthly payment for a loan you're analyzing; formulas that find the minimums and maximums of ranges of numbers; and formulas that allow you to pull variables from a list. Without these functions, you'd have to construct complicated algorithms to do these calculations.

Supercalc 3 lets you set individual column widths, hide data in columns to keep it confidential, translate files into formats usable by other programs, protect individual cells or blocks of cells from inadvertent deletion, and write self-running programs for mundane tasks such as printing files. Also, Supercalc 3 lets you consolidate files. This means that different files can be overlaid so that superimposed values are combined to create a consolidated sum in place of two or more separate values. This is useful, say, if you have several local sales reports that need to be totaled for a regional summary report. Instead of having to enter information from the local models into the summary report, you can have Supercalc 3 overlay the local models and automatically consolidate them into one report. Of course, the files must have comparable values in exactly the same locations for this to work properly.

Another feature, which is part of the database module as well as the

At a Glance

Name: Supercalc 3, Release 2.0

Type
Integrated spreadsheet with graphics and database and 8087 capability

Manufacturer
Sorcim/IUS Microsoftware
2195 Fortune Drive
San Jose, CA 95131
(408) 942-1727

Price
$395

Format
Two 5¼-inch floppy disks

Computers
IBM PC, XT, and compatibles, and the Texas Instruments Professional with 128K bytes of memory; no special graphics display cards required

Documentation
423-page loose-leaf manual with detailed tutorials and explanations of commands and built-in functions; "Ten Minutes to Supercalc 3" tutorial leaflet; 36-page reference manual detailing Superdata Interchange file-conversion program; graphics and command reference cards

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At a Glance

Name: Supercalc 3, Release 2.0

Type
Integrated spreadsheet with graphics

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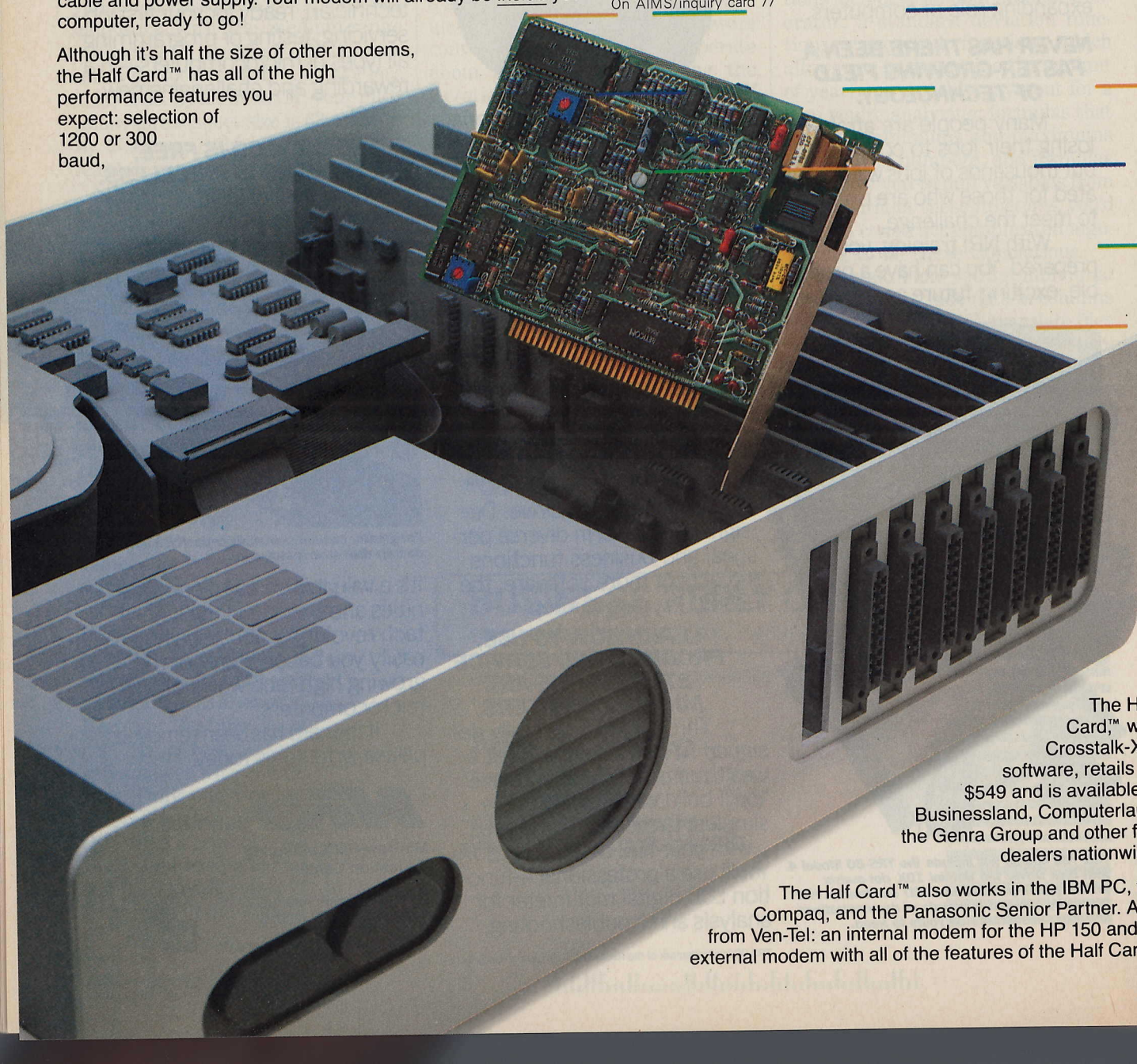

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spreadsheet, is the Arrange command used for sorting. With this feature, you can sort both columns and rows in ascending and descending order. In addition, you can sort the primary column or row in ascending order and the secondary column or row in descending order and vice versa. You can also sort parts of rows and columns. The program automatically readjusts any formulas that may be affected by the sorting process, but you should be cautious in using this last feature because you can end up with unexpected results. Sorcim suggests that you run the program without adjusting the formulas first to see if that will give the results you want. If not, you can adjust the formulas and perform the procedure again.

Supercalc 3's built-in financial functions are particularly useful if you work with loan amortization. And the calendar functions simplify project scheduling and other spreadsheet applications that need dates.

Another improvement: in previous Supercalc versions, it was always necessary to enter quotation marks before you entered any text. If you forgot to do this, the program would beep and indicate a formula error. You'd then have to go back and enter the quotation mark. Now you can decide for yourself whether you wish to enter quotation marks before text. If you choose to, you simply turn on the quotation toggle via the Global command. If you choose not to use the quotation marks for text entry Supercalc 3 will match each entry against a cell address or built-in function and accept it as text if there is no match. This improvement can be somewhat frustrating—if you're trying to write a formula and you miss a set of parentheses, your formula will be treated as text. On the whole though, this new method is a tremendous time saver when you're building a model.

Supercalc 3 uses all the IBM PC's cursor scrolling keys, which means you can use the END, PG UP, PG DN, and TAB keys to move speedily around your spreadsheet. For easy reference to your location within the spreadsheet, Supercalc 3 highlights the row letter and column number in the border displays. Also, for convenience's sake, Supercalc 3 lets you separate a cell range description, such as A1.A20, with a period or a colon, depending on your preference.

Supercalc 3's Textual Values function lets you "pick up" text as the contents of a cell or the result of a formula. (Textual values are text strings that the program treats in the same way it handles formulas or numbers.) With previous versions of Supercalc and in most other spreadsheet and integrated packages, you can't do this. For example, if you placed the word "winner" in a cell and wanted to write a formula that placed that word next to the winning result of a game or a contract-bidding contest, most spreadsheets would print a zero or an error message instead of the word. With Supercalc 3, if you place a word within parentheses and double quotes, for example, ("winner"), and reference the word in a formula, you get back that word. The textual value string can't be longer than nine characters, but by combining different strings using separate formulas, you can have your spreadsheet print out rather lengthy messages as the results of spreadsheet calculation. As well, Textual Values provides a means of accessing the entire ASCII IBM extended character set. The ASCII codes are listed in an appendix in the manual.

Supercalc 3's Superdata Interchange program translates Visicalc and Lotus 1-2-3 files into Supercalc files. You can also use the Superdata Interchange program to reformat comma-separated value files into Superdata Interchange files (an upgraded version of the Data Interchange Format—DIF) for transfer into Supercalc models. The process works in reverse, too—you can translate Supercalc data into comma-separated values or SDI files for use in other programs. Supercalc has always had this data-interchange facility (using DIF), but until now there was no direct Visicalc or Lotus

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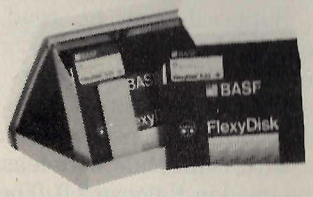

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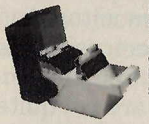
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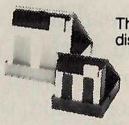
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Supercalc models are upwardly mobile. This means that models built with Supercalc can be read into Supercalc 2 and both versions of Supercalc 3, models built with Supercalc 2 can be read into both versions of Supercalc 3, and models built with Supercalc 3 Release 1.0 can be used in Release 2.0. The programs are downwardly compatible, too, as long as you don't try to build models with features not available in the version you want to exchange data with.

Graphics

Supercalc 3's graphics module lets you draw eight types of graphs: pie, bar, stacked bar, line, area, hi-lo, x-y, and exploded pie. As I've already mentioned, the good news for many people is that you don't need a color monitor or graphics adapter card. With a monochrome monitor, you can draw graphs on-screen using the View command. Although the on-screen shading details are not quite like the printed version of the graph, the shape of the graph is exactly as it is on the hard copy. All graphs that you create for a spreadsheet are automatically saved when you save the file.

You can save up to nine different graphs with each spreadsheet. To view the graphs as you work on the spreadsheet, you first construct them using the View command; then to view them at any time, you just hit the F10 key or Control-T. To plot the graph at any time, all you have to do is hit the F9 key or Control-Y. If you need more than nine graphs per spreadsheet, you can save a copy of the spreadsheet under a different name and create up to nine additional graphs in the new file.

Graphics cannot be incorporated into a text file, however. You have to print the graphs while the current file is on-screen. To include graphs in text, you must physically cut and paste the graphs where they go.

Changing default settings for graph colors, fonts, or size or changing the plotting device on which you want to print requires little more than working with the Global Graphics command. And if you have both color and monochrome monitors, you can display the graphs on the color monitor and the spreadsheet on the monochrome. You can also reset the defaults so that the graphs are not changed automatically when you make changes in the spreadsheet or database. Unlike some other programs, Supercalc 3 doesn't require that you use the utilities disk or a separate print disk when you are ready to print the graphs you have made. Supercalc 3 takes care of everything in the main program.

Instructions for using the graphics module are readily understandable. I drew my first graph with only a few quick peeks in the manual. Once you have drawn the first simple graphs as suggested in the 10-minute tutorial, you really need only take a refresher glimpse at the manual or call up the Answer Screen.

Database

Supercalc 3's database management system stores, finds, and selects data from any of your spreadsheet fields. While not a very fancy database program, it does simplify the storing and retrieval of information. It allows you to extract data from your records in any order using the Arrange command in the regular spreadsheet mode. The program has no data-table capability wherein the program automatically constructs a table of values based on a formula and variables you specify. Neither does it have any built-in statistical or arithmetic functions. The lack of these functions is not a serious drawback, however. All it really means is that, instead of being able to evaluate a table or matrix of numbers, you'll be limited to evaluating one row or one column of numbers at a time.

Supercalc 3 is integrated to the extent that changes made on a spreadsheet model to which you have assigned graphs will appear on the graphs. Similarly, any changes made to a database that you've graphed will appear in the graphs. You can't change the variables in a graph without changing the spreadsheet or database that supports the graphs. However, you can change incidentals such as graph labels, titles, and fonts without changing the supporting spreadsheet or database data.

Reports

Routine printing of reports is fairly straightforward. You can print all the information displayed on the video screen or just a listing of cell contents or formulas. You can send what you want printed to the screen first to see how the printed copy will look. You can also save copy on disk for output to paper later.

Using the Setup option, you can specify page dimensions, single or double spacing, type size, and whether you want to send formfeed characters. You can specify the range of the spreadsheet to be printed. And you can print wide reports sideways on narrow paper using the Sideways program from Funk Software that is included on the utilities disk. (The Sideways program is modified to work only with Supercalc 3.)

On-screen formatting capabilities are fairly standard, with a couple of exceptions. You first enter the Format command and are asked for the level of formatting you desire. You can format the entire spreadsheet (Global), a row, a column, or a single entry or range. Standard formats include Integer, Scientific Notation (exponent), $ for two decimal places, Right and Left to line up values on the right or left side of the column, Text Right, Text Centered, and Text Left for lining up labels on the right, center, or left side of the column, and * for very basic graphics display. The Hide format feature allows you to hide the contents of a cell—helpful if you want to keep confidential certain information.

Supercalc 3 lets you define eight formats using a combination of the following options: floating $, embedded commas within numbers, minuses in parentheses, zeros displayed as blanks, percentages, a fixed number of decimal places, and scaling factors. You can use any or

all of these special attributes to define a user format.

Supercalc 3 also has a Protect command that prevents inadvertent erasing or writing over the contents of any cell. A Global protection toggle must be turned on to activate the Protect command. This lets you safeguard individual cells yet still have a chance to edit them before you turn on the Global protection feature. To make changes to a protected cell, you use the Unprotect command.

In putting Supercalc 3 to the test, I consciously looked for faults and am hard-pressed to report any major drawbacks. Its spreadsheet is a proven entity made more useful with faster, natural-order calculations and the 8087 capability; its graphics program is attractive because it runs on a standard computer system without additional hardware; and its database, while lacking some fancy features, does a good job of storing, sorting, and retrieving data. Supercalc 3 is fairly easy to master, with the Answer Screen always ready to help you when you have a problem. The graphics module and the database program make what was already a good program even better. □

LANGUAGES

Turbo Pascal

Powerful, convenient features make this applications development package a great value

by Dave Garland

Every once in a while, a truly exceptional software product comes along. But when the price of such a product is only $50, it's an occasion, and Turbo Pascal from Borland International is just that. This single, well-integrated package gives you an editor, a Pascal compiler, a linker, and an operating system shell. In a welcome break with tradition, the CP/M-86, Concurrent CP/M, and MS-DOS (PC-DOS) versions of Turbo Pascal cost the same as the CP/M-80 version. And while many software publishers do a less-than-optimum job of translating programs written for the 8080 processor to a form usable by the IBM PC's 8088 chip, Turbo Pascal has been written from scratch for each processor.

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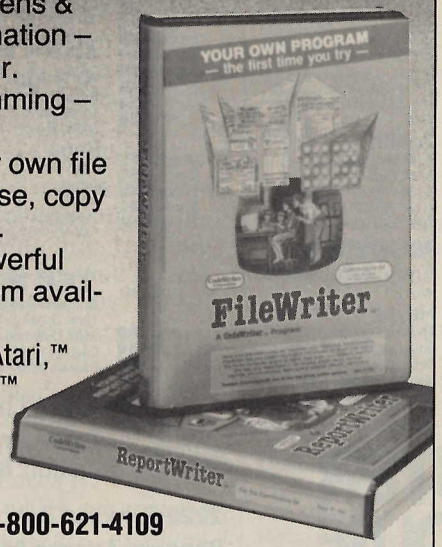

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allows you to develop very large programs through the use of overlays. Also, the new Turbo Pascal supports windowing, graphics, color, and sound on the IBM PC and its compatibles. There's even a version called Turbo-87 that takes advantage of the 8087 arithmetic coprocessor often installed in an IBM PC.

Turbo Pascal's most distinguishing feature is its speed. Not only does it compile and run programs quickly, but it also speeds program development by keeping both the editor and the compiler in memory at the same time (the publisher has clearly put some thought into reducing the drudgery of the edit-compile-run-debug cycle). In addition to speed, Turbo Pascal boasts an efficient design. Most Pascal compilers barely fit on a disk, but Turbo Pascal packs an editor, compiler, linker, and run-time library into just 29K bytes of random-access memory. The system disk also includes a sample program called Microcalc, which functions as a stripped-down version of Visicalc. With over 1200 lines of code, it serves as a good example program for students of Pascal.

Using Turbo Pascal

After typing TURBO to load the system, you're presented with a main menu that includes commands for displaying the directory, editing, saving, compiling, or running programs, and changing compiler options. To enter a program, you first specify a work file name—if the program already exists, it is loaded from disk. Selecting the edit option immediately puts you into the full-screen editor, where you'll find editing commands that are almost exactly the same as Wordstar's commands in nondocument mode. Thus, if you use Wordstar, you already know the Turbo editor. Otherwise you'll have to learn the various Control-key sequences for entering and editing, all of which are covered fully in Turbo Pascal's excellent documentation.

Dave Garland is president of Micro Progress Systems Inc., a microcomputer consulting firm based in Parsippany, New Jersey.

Once you've typed in a Pascal program and left the editor, the main menu reappears and the program's source code remains in memory (it is not saved on disk unless you specifically command the system to do so). Typing R at the main menu compiles *and* runs the program; typing C compiles the program and returns you to the main menu. If the system finds any errors, either in compiling or running, it jumps to the editor (still in memory), positions the cursor at the offending line, and displays an error number and message at the top of the screen. Repairing a program that's missing a semicolon, for example, takes only seconds, thanks not only to Turbo Pascal's speed but also to its elimination of disk accesses. Once a program passes as workable, you can save the source code on disk with a single keystroke.

To transform this workable source code into a stand-alone, executable program, you select from the main menu a compiler option that writes object code to disk rather than leaving it in memory. The result is a version of the program that can be run from the operating system. Because the program is loaded without the Turbo Pascal compiler and editor, you lose the convenience of having an erroneous line presented to you by the editor, but you are given the address at which the error occurred. When you do load Turbo Pascal to edit your program, you can enter the address and the system will find the line for you.

Another compiler option lets you chain programs. In this case, you specify a main file name at the main menu, and the work file name is assigned to the current file being edited. The difference between the two is that the main file, when compiled, includes the Pascal library routines: the programs compiled under the chain option must be called from a main program.

The latest version of Turbo Pascal also lets you use program overlays. Whereas chained programs are swapped in and out of memory as wholes, overlays rely on a main program that remains in memory at all times. That main program can call as many as 100 overlay programs, which the system automatically loads into memory at the proper time. Because the overlays are all loaded into the same area of memory, they may be used only one at a time, but careful planning enables you to develop huge programs with this option. The only penalty is the loss of speed stemming from repeated disk accesses.

Installing the System

Turbo Pascal includes an install program (TINST) that configures the editor for various video display terminals (VDTs). Common VDTs are included in a menu, but if yours is not mentioned, you can follow the procedure for typing in individual VDT commands. In copying these commands from the VDT documentation, beginners may find it confusing that while most VDT manufacturers specify commands in hexadecimal, Turbo Pascal requires

At a Glance

Name: Turbo Pascal

Type
Pascal compiler and editor

Manufacturer
Borland International
4113 Scotts Valley Dr.
Scotts Valley, CA 95066
(408) 438-8400

Price
$49.95; Turbo-87 is $89.95

Format
Two 5¼-inch single-density floppy disks or one double-density disk, depending on computer

Computers
Z80-based CP/M-80 (version 2.2 or higher) machines (including Z80-equipped Apple IIs) or IBM PC and compatibles running CP/M-86, MS-DOS (PC-DOS), or Concurrent CP/M

Documentation
Excellent 254-page typeset paperback; includes refresher course on some of Pascal's fine points

Audience
Anyone interested in Pascal applications development; especially good for students

decimal. For this reason, a hex-to-decimal conversion table of the sort included in most computer primers will come in handy.

The install program also lets you reconfigure the edit commands to virtually anything you're comfortable with. If you don't use Wordstar and therefore cannot appreciate Turbo Pascal's nearly identical editing commands, chances are that you can use the install program to modify the commands so that they resemble those of an editor you do know.

A Comparison to Pascal/MT+

Turbo Pascal is quite similar to Digital Research's Pascal/MT+, which follows very closely the standard that Jensen and Wirth describe in *Pascal User Manual and Report* (Springer-Verlag, 1978). Turbo Pascal deviates slightly from this standard in that procedure and function names cannot be passed as parameters to other procedures and functions, GOTO statements cannot leave the current block, expanded Read and Write procedures replace Get and Put, the Page procedure is not included, and error messages and numbers are unique to Turbo Pascal. Because the error messages reside in a text file on disk, however, you can easily standardize them or even translate them into another language.

Another difference between Turbo Pascal and Pascal/MT+ concerns systems developers only. Pascal/MT+ includes a number of library functions to access the operating system and special machine instructions, and it also allows the programmer to assign specific addresses to the code and data sections so that the program can reside in read-only memory. Turbo Pascal, on the other hand, is intended to be used only under an operating system. Both Pascals can access absolute memory addresses and I/O ports, however, and both permit in-line assembly language in Pascal programs.

A matter of concern to all programmers is the accuracy of floating-point arithmetic calculations. Turbo Pascal uses a binary floating-point format accurate to 11 digits, while Pascal/MT+ lets you choose either 7-digit binary or 18-digit binary-coded decimal (with 4-digit decimal) floating-point formats. The latter, aside from providing greater precision, eliminates round-off errors stemming from conversions between binary and decimal numbers. If round-off errors are a concern, you can opt for Turbo-87, a version of Turbo Pascal that provides support for the 8087 math coprocessor available for the IBM PC and compatibles. Turbo-87 boosts accuracy to 16 digits and performs floating-point calculations much more quickly.

The major difference between Pascal/MT+ and Turbo Pascal lies in the speed of developing programs.

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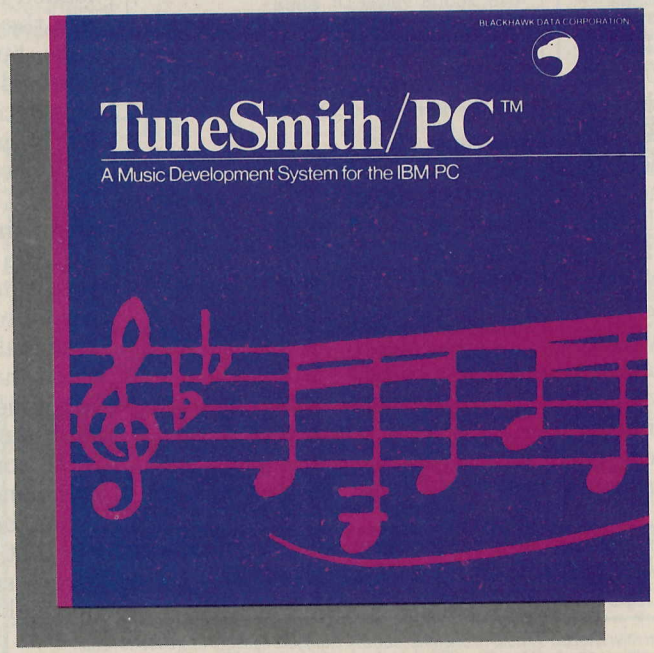
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The benchmark program Borland uses in its advertising can be compiled and linked in 90 seconds under Pascal/MT+ as opposed to 1 second under Turbo Pascal. While benchmarks are to be taken with a grain of salt, a factor of 90 represents a very considerable difference.

IBM PC Support

The latest version of Turbo Pascal includes a number of features attractive to owners of IBM PCs and compatibles. Aside from the advantages of the Turbo-87 version mentioned earlier, all CP/M-86 and MS-DOS versions now support windowing, color displays, graphics, and sound generation. You invoke these features by calling built-in procedures, thus enabling you to take advantage of the PC's hardware features entirely from Turbo Pascal.

To put my evaluation in a nutshell, I'd say that Turbo Pascal is an absolutely incredible value. For less than the price of the Pascal/MT+ SPP editor alone, you get a complete Pascal development system. In fact, even if your requirements demand a product like Pascal/MT+, it's worth buying Turbo Pascal just for editing and checking your programs.

Before investing a lot of time and effort in developing programs for a new compiler, most people like to know that the software is portable to other machines. Turbo Pascal is available for a large number of operating systems, and the company seems to be committed to keeping the product current as new systems emerge. All told, Borland's Turbo Pascal leaves virtually nothing to be desired. □

EDUCATION

Micro Speed Read

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by Bart Pisha

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words per minute. Without too much trouble, that rate can be doubled. And although more the exception than the norm, reading speeds in excess of 1000 words per minute are not unreasonable to expect. This program is designed for average readers rather than for persons who have serious reading difficulties or those who are already able to read 500 or 600 words per minute.

Micro Speed Read stresses techniques similar to those taught in the widely available, popular, and effective classroom-based speed-reading courses. And though the course content is similar, using this program gives you several advantages over attending classes: you don't have to leave your home, you can progress at your own pace, and you can work at your own convenience. However, as with any speed-reading course, you should expect to spend 20 to 40 hours learning the techniques. You'll get the maximum benefit from your effort only if you apply what you've learned to your reading after you've completed the lessons.

Technique Counts

The techniques Micro Speed Read covers include *idea clustering*, which means grouping words and ideas so that you needn't read every word to understand what the writer is saying; *pacing*, or training your eyes to follow one of several routes as you read a page; *surveying*, getting a general idea of what the passage will say before you actually begin to read it; *rapid reading*, which is reading at an accelerated pace with about 90 percent comprehension; *skimming*, which is faster still and should yield 50 percent comprehension; and *scanning*, or reading at speeds in excess of 1000 words per minute to locate specific facts.

An important concept here is that 100 percent comprehension is not necessary in all reading situations, so in some cases readers can begin saving time by simply setting lower comprehension standards. Some of the methods this program teaches can be practiced together for maximum benefit, while others are appropriate when practiced singly, and only for certain reading tasks.

The Micro Speed Read package for the Apple IIe consists of four disks and a 200-page manual. The manual is clearly written, and its practice passages are interesting and similar in content and difficulty to what you'd find in *Reader's Digest*. Also included in the manual is a list of popular books, such as *Call of the Wild, The President's Plane is Missing, Roll of Thunder, Hear My Cry,* and *The Good Earth*, which are suitable for extended practice. A readability formula, for determining the relative difficulty of written materials, is included as an appendix.

Micro Speed Read uses the unique capabilities of the computer in several ways. All techniques are introduced and initially practiced on-screen, and follow-up lessons use passages from the manual. The program takes advantage of the computer's power by presenting material on-screen at rates you determine. Some material can also be presented with the paths the eye should follow represented by lines on the screen. The program's ability to vary the speed of presentation lets you challenge yourself to read at a rate slightly above your current comfortable rate. For all passages, whether on-screen or in the manual, the computer presents comprehension questions, scores your responses, and gives the correct answers. The computer can also calculate your reading rate for all materials presented on-screen or printed in the manual. A graphing function allows you to track your improvement in speed and comprehension.

Each disk has a menu, allowing you to select the lesson you wish to use. At the end of each lesson on each disk, you're returned to the menu. You may then repeat the lesson you've just completed, go back and review another lesson, or go on to the next.

As you begin using each disk you are prompted to enter your name. With that, Micro Speed Read sets up a file that will keep track of your speed and comprehension scores. This file must be created anew when you complete each disk and begin the following one.

An introduction, or demo, on the first disk explains the main techniques and demonstrates several aspects of speed reading. By using it, you can begin to understand the patterns of eye travel that Micro Speed Read teaches and start the important confidence-building process.

How Fast Can You Go?

The first lesson is entitled "Estimating Your Present Speeds." This lesson (and all the others in the program) has a clearly stated learning objective presented both on-screen and at the beginning of its companion chapter in the manual. You'll also find a concise summary at the end of each lesson. This format helps you to understand exactly what you are doing and grasp the program's rationale. Because of memory limitations, about two-thirds of the practice readings are printed in the manual but are used with the on-screen lessons. The other third of the readings is presented on-screen with the computer varying presentation speed depending upon the rate you've chosen.

To begin the "Estimating Your Present Speeds" lesson, you read a passage from the manual, and the computer, working as a stopwatch, does the timing and arithmetic necessary to arrive at your "personal" or comfortable reading rate. You then go on to establish your "pushing" or rapid reading rate, and your "skimming" and "scanning" rates. For each of these types of reading the program records your rate in words per minute, and your comprehension in terms of the percentage of questions that you are able to answer correctly. This lesson establishes the baseline against which all of your subsequent work can be measured. The graphing option can then visually represent your baseline and show your progress.

Bart Pisha is an educator, teacher trainer, and doctoral candidate at Harvard University in reading, language, and learning disabilities.

Idea clustering, introduced in the next lesson, entails training your eyes to "soft focus," or concentrate not on individual words but rather on groups of up to five related words. Micro Speed Read provides practice in this skill both on-screen and in the manual. The computer is used to display groups of words, each of which relates to the same important idea, at various places on-screen to simulate the moves your eye would make while clustering ideas during the reading of a printed page. After completing this exercise on-screen, you're directed to a section in the manual where the text is printed in the same sort of word groups. The idea is to let your eyes float freely and efficiently from group to group.

The "Preliminary Pacing Patterns" and "Advanced Pacing Patterns" lessons help you train your eyes to follow efficient patterns as they move through text, using the idea-clustering techniques already taught. The patterns are intended to help you avoid "reading" the blank space on the page or words that don't fit into the idea clusters you create. The program teaches four pacing patterns, first using on-screen presentation of text, then using manual pages with the pattern lines drawn in, and finally using manual pages with only text. Each of these pacing patterns is slightly more efficient and difficult than the preceding one.

The SQ3R Way

The five lessons I've discussed above lay the groundwork for the next four lessons. The sixth lesson is primarily a computerized presentation of the very highly regarded "SQ3R" (Survey, Question, Read, Recite, Review) method of digesting large amounts of text rapidly. When you've mastered this technique, you may expect a significant increase in reading speed and comprehension in the 90 percent range.

The computer teaches the survey step by first presenting a passage at 1000 words per minute and asking that you find only the main idea. Next, it presents a passage with

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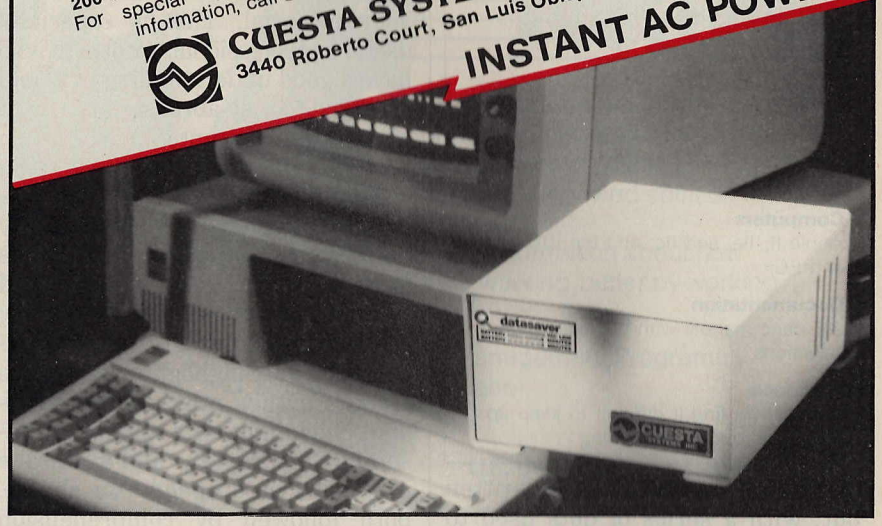

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At a Glance

Name: Micro Speed Read

Type
Speed-reading trainer

Manufacturer
CBS Software
One Fawcett Place
Greenwich, CT 06836
(203) 622-2500

Price
$125

Format
5¼-inch floppy disk

Computers
Apple II, IIe, and IIc, and the IBM PC and PCjr

Documentation
200-page manual with practice reading selections

Audience
People who find it difficult to keep up with their volume of reading

only the major idea clusters written out, with a series of dots used to represent the less important words. Finally, after the program gives you an in-depth explanation of the method, you're ready to try two practices on-screen and two in the manual. Again the program calculates your reading rate and asks comprehension questions. You can practice the skills you learned in the first five lessons while you work on this one, and, if you desire, the computer displays the two on-screen practice passages with any of the four pacing pattern lines drawn in.

The recite step can take different forms and is used when you're reading material that you'll need to remember for a long time. Some readers find it effective to write a brief summary of the material in outline form. Others find that a loosely structured diagram of the main ideas, supporting details, and examples can be constructed more rapidly and efficiently. Micro Speed Read users will need to use pencil and paper for this step, whether working from the disk material or manual selections. Either of these methods provides you with brief notes that can be consulted later, if you need to review. This can be especially helpful to students who may need to summarize a large body of material to prepare for a test.

The seventh and eighth lessons teach skimming and scanning skills. Skimming is useful when you want to read very quickly and need to understand only about 50 percent of your material. This is especially useful to professionals or others who have a good understanding of a field but need to stay abreast of the most recent developments.

Micro Speed Read teaches skimming by first explaining it on-screen, then presenting a passage with only the first two paragraphs, key words from the body of the passage, and the final paragraph visible. Finally it presents a passage with the important points highlighted in reverse video. Further practices are available, including one passage presented very rapidly and a passage presented at a speed you choose, both followed by comprehension questions.

Scanning is reading at ultrahigh speeds, in excess of 5000 words per minute. At that reading rate few people can actually "read" the material, but most can learn to pick out critical facts. Micro Speed Read can help you learn to answer who, what, where, when, and why questions without actually reading large selections. This technique can be a real lifesaver for people who need to find answers fast.

The Spoils

The final section is the psychological payoff. It does not teach any skills but rather allows you to test yourself for speed and understanding, using three different types of reading, and to compare your results with the baseline established when you first began using the program.

Micro Speed Read is an attractive alternative to standard classroom speed reading courses; its flexibility allows you to choose your practice time, repeat lessons if necessary, and do your work at home. It is not a "cure-all" product and does not pretend to be able to work miracles and improve deficient reading ability without the investment of significant effort on your part. But if you're willing to invest time and energy, Micro Speed Read can be a real help. And when you've finally waded through that mountainous reading pile, it'll be time to tackle the next wave of magazines and newspapers. □

WORD PROCESSING

The Write Choice

A modest, effective word processor for writers on a budget

by Joseph J. Elia Jr.

Most students and aspiring writers find computers an expensive investment, and those who manage to round up enough cash to buy one soon learn that software isn't free. Indeed, popular full-featured word-processing programs usually cost hundreds of dollars. Some newcomers, therefore, find themselves driven to look at less glamorous, more affordable alternatives.

At $44.95, The Write Choice is one of these more affordable word processors for the Apple II family of microcomputers. But to make the product stand out from the crowd of low-cost programs, Roger Wagner Publishing (the manufacturer) has given the software package a little sparkle by adding extra features. In addition to the basic word processor, called The Correspondent, you get a typing tutor called Tut's Typer; a utility program called The Analyst, which measures the readability of your prose; a little style manual that offers advice on topics like setting up business letters and splitting words at the ends of lines; and a copy of Strunk and White's *The Elements of Style*, a classic book of guidelines for writers.

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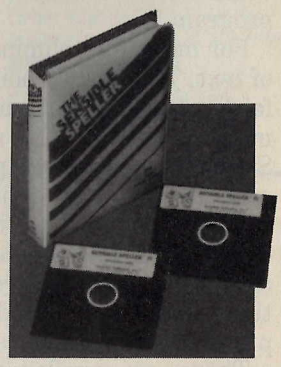


*It works with all the following word processors, with owners of trademarks indicated in parentheses: DOS 3.2 & DOS 3.3-AppleWorks & AppleWriter, all versions (Apple Computer, Inc.); Bank Street Writer (Brodebund); Format II (Kensington Microware); HomeWord & Screen Writer (Sierra On-Line Inc.); Word Handler (Silicon Valley Systems); CP/M-Wordstar (Digital Research Corp.-Micropro International); PFS: WRITE (Software Publishing, Inc.); and others. All features are not available with CP/M, PFS: WRITE & Word Handler. Macintosh is a trademark of Apple Computer, Inc.

On AIMS/inquiry card 96

Strunk and White's book is readily available in bookstores for about $3, so there's no reason to run out and buy The Write Choice just to get the book. Also, a typing tutor and a manual of advice on formats for business letters are by no means essential components of great word-processing software. But when a publisher nods in the direction of careful writing, that's impressive (especially in view of what passes for prose in most program manuals).

What About the Meat?

The word-processing portion of The Write Choice is structured around two chief modes that you flip between: edit mode and file mode. (Two others—move and copy—are used much less frequently.) Basically, edit mode is where you compose and fine-tune your document. File mode lets you save the document on disk, print it, or even erase it. Flipping between modes is simple: to get to file mode from edit mode you merely hit Control-X, and to get back you just hit the space bar.

Moving around within the text itself is easy if you're using an Apple IIe—the cursor goes where the arrow keys send it. On earlier Apples, which lack the full set of arrow keys, you have to press the Control key and the H, U, J, or K key to make your moves. This is less convenient but not really the fault of the program.

For moving or eliminating blocks of text, The Write Choice gives you fairly standard features in a third mode known as the move mode. Similarly, a copy mode provides you with the means of duplicating text at other positions in a file. However, the program does not offer the sort of global search-and-replace functions commonly found in higher-priced word processors.

There are similar tradeoffs in deleting smaller amounts of text. The program handles line and word deletions fairly conventionally: you can eliminate whole words with Control-G (the manual calls it "Control-Gobble," honest). A whole line disappears when you place your cursor at its beginning and hit Control-Z ("Control-Zap").

But The Write Choice uses two unusual ways to remove individual characters. In one, you press Control-R to remove the unwanted letter (at the cursor's position) and pull the remaining characters on the line one space to the left. And as you'd expect, if pulling those characters leftward leaves enough room, a word from the next line will be pulled up, causing a general reshuffling all the way down to the end of the paragraph. The other way to erase a letter is to use the Delete key, which deletes the character to the left of the cursor but does not tighten the remaining characters or reform the paragraph.

Personally, I'm used to word processors that use the Delete key to the fullest. With such a program (Apple Writer II, for example), character deletion and text reformation is a simple, one-keystroke affair. However, these programs typically cost four to five times as much as The Write Choice—if you don't have a lot of money in your software budget, you certainly can learn to live with a somewhat quirky method of character deletion.

The role The Write Choice assigns to the Tab key also is unusual: pressing it creates a blank line where you can insert additional words in the midst of a document. Other word processors I've used feature some sort of insert mode that lets you put the cursor in the middle of text and start typing; the new words make room for themselves by pushing the existing text down. But not so with The Write Choice. Here you are always in "overstrike" mode, and if you start typing in the middle of a line, you type over (and eliminate) everything under the new material.

So, to add rather than replace text, you must first insert a blank line with Tab (or Control-I) at the point where you want to add new words. On the screen, the effect looks just like a fractured line. When you've finished with the insertion, you press Control-R to remove any remaining space and join the paragraph's parts back into a smooth whole. (By the way, you have to separate paragraphs with blank lines; if you don't, the Control-R command will cause them all to be merged into a single unit.)

Writers who do a lot of revising and fiddling will find that all of the pauses to open blank lines before inserting text and then again to close up the spaces afterwards will slow them down. Thus The Write Choice is not the best choice for people who typically crank out large chunks of prose, but low-volume writers should find it adequate (and blessedly cheap) until they mount an assault on the best-seller list.

Files, Flaws, and Support

To save your work on disk, you must enter the file mode by typing Control-X. Once you're there, saving a file is a snap. To give the new material the same file name you used when you opened the file, all you do is press the slash (/) key. You may, of course, save your work under a new file name—when you type the first letter of the new name, the pro-

Joseph J. Elia Jr., a frequent contributor to *Popular Computing*, is manager of editorial operations at *The New England Journal of Medicine*.

At a Glance

Name: The Write Choice

Type
Word-processing system including typing tutor and prose analyzer

Manufacturer
Roger Wagner Publishing Inc.
Suite E, 10761 Woodside Ave.
Santee, CA 92071
(619) 562-3670

Price
$44.95

Format
Single 5¼-inch floppy disk

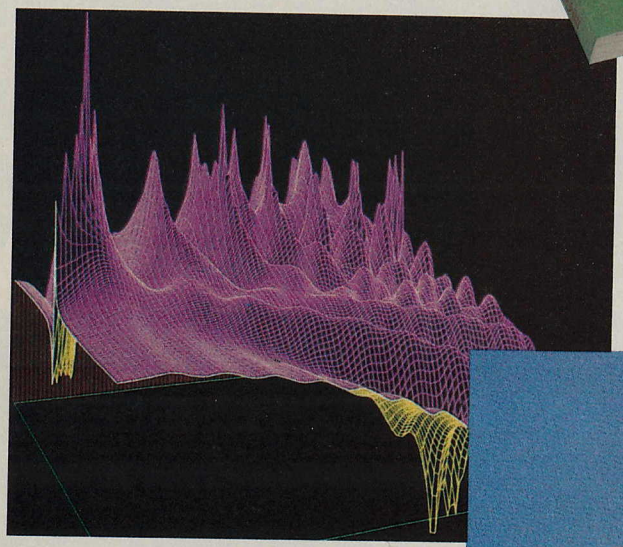
Computers
Apple II family

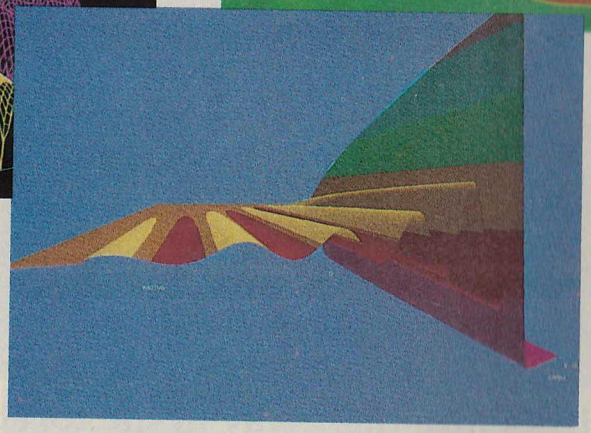
Documentation
150-page spiral-bound manual including style guide, plus *The Elements of Style*, by Strunk and White

Audience
Students and others needing an inexpensive word processor

"I hope the average reader enjoys the book at least as much as I did."
—Carl Sagan

Art and the Computer illustrates how artists are using computers as tools to create totally new art forms. Written by Melvin Prueitt, with an introduction by Carl Sagan, the book is filled with hundreds of color illustrations. It is the first and only comprehensive collection of the fine art being produced in this medium.





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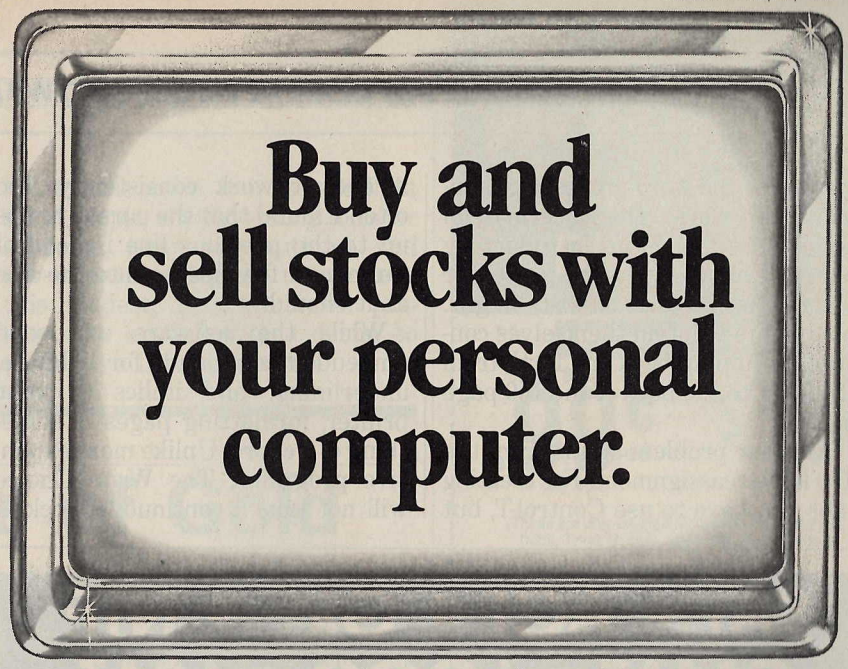
gram understands that you're creating a new file.

And speaking of files, I was surprised to find that The Write Choice stores documents as binary files rather than the more common text files. The publisher reports that binary files are used because they take up less space on a disk—a block of prose that takes up 17 disk sectors as a text file occupies only about 13 sectors as a binary file, according to the company. This 20 percent savings is appreciable.

But what if you want to send a document electronically? Most communications systems are designed to handle text files and would balk at their binary cousins. Fortunately, The Write Choice makes it relatively simple to convert a binary file into a standard text file. You merely call the binary file (JOEFILE, for example) from the disk and save it again, this time using .TEXT as an extension to the file name (JOEFILE.TEXT). The Write Choice then creates a text file that contains carriage returns at the ends of lines—a very nice feature if you send letters via MCI Mail or another system that demands these carriage returns.

The Write Choice does its chores—especially its file saves—with admirable speed because all of the program resides in the machine's memory, not on disk. You simply load the program into memory at the beginning of a session and then forget about it. The nice thing about this is that you need only one disk drive, but you pay a price: 27K bytes is the maximum file size. This equals about 15 double-spaced pages (the same maximum allowed by Apple Writer II, by the way).

I do have a few complaints about the product, though. Although The Write Choice's manual has a casual, helpful tone, finding your way around in it can be a problem. The publisher has placed the style manual in the same book with the program's documentation; in fact, they share the same index. If you go looking for help on, say, how to number pages, you don't know whether the index will send you to the style



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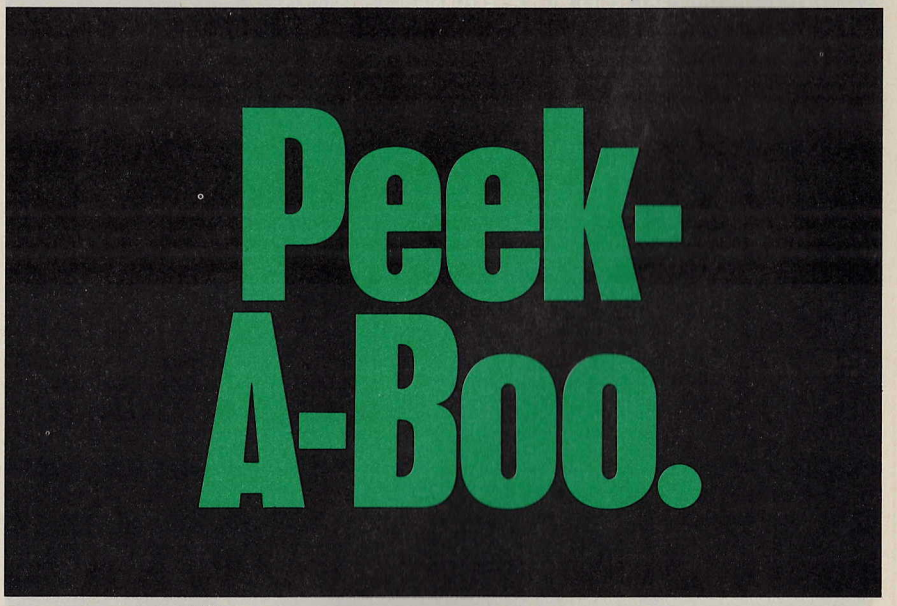

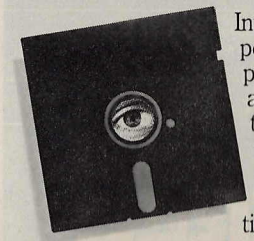

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manual or the word-processing manual. Even worse, the style manual appears between the introductory material about the word processor and the instructions on installing it. New users will find themselves constantly flipping back and forth from the front to the back of the 150-page book.

Another problem stems from the Tab key's reassignment. For creating tabs you have to use Control-T, but it doesn't work consistently. Too often I found that the cursor jumps up to the previous line instead of jumping a few spaces into the line as it should.

While the software will send embedded commands for boldface, underlining, and italics to your printer, formatting pages is something of a chore. Unlike more expensive programs, The Write Choice will not take a continuous block of prose and break it into separate pages when you print the document. You must keep track of bottom and top margins with a built-in line counter. Assuming you've set up the default for a 66-line (standard) page, you must stop typing every time the counter reaches about 58 and leave space for page numbers, which can be inserted automatically if you wish.

Earlier releases of the program forced those of us who spend our writing lives in double-spaced mode to remember that *our* pages break at line 33, not 66. But the publisher has fixed this problem. I spoke with Tom Burns, who handles technical support for The Write Choice, and he promised to mail the updated disk immediately. (By the way, Burns offered the update *before* he knew I was a reviewer—even though page formatting can be a chore, customer support is excellent.) The revision (version 4.7) arrived in due course, and it worked as promised. When you set the program for double-spacing, the numbers in the line counter advance two at a time: 1, 3, 5, and so on.

Is It the Right Choice?

The Write Choice's bonus programs round out a useful package. The typing tutor combines drills (you learn groups of letters by typing them over and over) with a typing game (you try to type words quickly, before on-screen monsters gobble them). This seems like a reasonable way to learn, and the tutor even includes lessons on the Dvorak keyboard layout.

The prose analyst can also come in handy. Based in part on the "fog index" familiar to technical writers, the program counts the number of words in a text file and then figures averages for word length, number of words per sentence, number of sentences per 100 words, and number of syllables per word. From these findings the program creates a rough "readability score" and calculates the minimum grade level for which the writing is appropriate. Although the prose analyst can't tell

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you how to write great literature or even better term papers, it will at least count words for you and let you know when you're using too many long words or long sentences.

All told, then, The Write Choice is not a full-featured word processor, but for the price, it *is* an excellent set of simple, sturdy writing tools for students, beginning authors, and low-volume writers. I recommend this modest, effective word processor to anyone with a desire to write on a limited budget. □

GAMES

Seven Cities of Gold

New worlds await explorers in this role-playing adventure game

by Dan Gutman

Fans of adventure and role-playing games are accustomed to exploring medieval temples in fictional worlds and battling dragons, elves, gruds, and the like. Rarely do they get the chance to step out of the cave and explore the real world.

Seven Cities of Gold offers adventurers a breath of fresh air. The game sends you off on one of the greatest real adventures man has ever attempted—the discovery of the New World. As a Spanish conquistador in the late 1400s, you recruit a crew, gather food and provisions, then set sail for the Americas. Gold and glory lie on the other side of the Atlantic, as well as destruction, disgrace, and death.

The fascination of this one-player game comes from the adventure, not the graphics. No high-resolution graphics signal, for instance, the first sighting of land from the crow's nest of the *Santa Maria*. All the graphic displays take place in a box that fills less than half the screen; vital information on your voyage covers the rest of the screen.

While sailing, you see an aerial view of your fleet (which may number as many as four ships) as it crosses the Atlantic. Once on land, you find the terrain dotted with blocky trees, rivers, and tiny arches representing, no, not McDonalds, but tribes of natives. When your crew reaches one of the arches, the display zooms in to show a close-up of the native village, and your character is right in the middle of it.

The game has more than 200 of these villages—communities of poor hunters and rich hunters, primitive agricultural villages, and advanced agricultural villages. Each community will respond to your character in a slightly different way. Most often, the villagers gather around him as if he were some kind of alien, which he is. If you like, you can maneuver him right over the natives and mow them down Robotron-style—they pop like bubbles. That can be fun for a few minutes, but it doesn't win you or your character any brownie points with the chief or the folks back home. (By now, of course, you have completely identified yourself with your character, such is the absorbing nature of role-playing adventure games.) Moreover, word of your hostile manner travels fast—the villagers in the next community will be prepared.

Instead, the game encourages you to make friends with the natives. You can startle them (your character glows), but that only mollifies them for a moment. Smart explorers will outfit their expedition with plenty of flashy goods that can be given away as gifts. When you meet the chief in the center of a village, a small gift may entice him to give you some gold, valuable directions, or even a few native bearers to carry your supplies and lead you to more gold. He may invite you to establish a mission in his village. If nothing else, he may

Dan Gutman is a freelance writer living in New York City.

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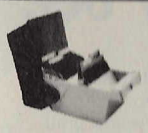

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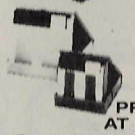

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decide not to kill you right away.

Seven Cities of Gold allows itself to be shaped by each player's distinct personality. If you march into villages, slaughter all the natives, and take their gold, you'll gain some quick victories and leave some bad memories. If you choose to trade with the natives, you'll use up all your goods and take years to explore the New World. Your actions, all joystick-driven, have a decided effect on the outcome of the game.

Charting New Territory

After you leave or are chased out of a village, the display shows a broader view, and you can continue exploring. You may have gathered a little more gold, and you may have lost a few men. The screen notes these facts, in addition to the date (April 1493, for instance), how many goods you have left, and the status of your food supply. As the months go by, your food supply is automatically depleted in relation to the number of men in your expedition. If you're busy exploring and you run out of food, you and your men die of starvation and the game is over. Discovering America, the game makes clear, is no Sunday drive in the country.

Every time your ship touches unexplored land, the game adds a small piece to the map it is constructing. When you discover Florida, you'll know it—the familiar peninsula will jut out across the screen. That should help you get your bearings. Then you can sail up the Atlantic coast or south to discover those islands in the Bahamas that you've always wanted to visit.

Perhaps the most interesting part of Seven Cities is its random continent generator. After you've explored every square foot of America, there is still more to conquer. The program will, if you like, create a new continent, complete with imaginary land masses, trees, and rivers. And according to the documentation, your new random world will be constructed according to the established geological rules of plate tectonics. (Remember just two years ago, when we thought Pac-Man was sophisticated?) You can also copy the entire game with your new New World on another disk and give it to a friend to play.

At some point you'll want to interrupt your explorations and sail back to Spain. This isn't just to have a reunion with your high school buddies. You can stop off at the Pub to save your game on disk and see the records of your accomplishments—how much land and water you explored, how many natives you encountered, how many missions you established, and how much gold you acquired. A quick trip to the outfitters will replenish your supply of men and goods, and a trip to Court will acknowledge your accomplishments or confirm that you are a disgrace to your country. Then it's back to the New World for you, now older and wiser. You never "win" Seven Cities of Gold. The object is simply to discover more land, more civilizations, and more wealth.

In addition to the unusual theme, the game's careful attention to detail makes Seven Cities of Gold intriguing. As you scroll over a realistic map of two continents, even the rivers are in the right places. You will find that there is more food close

At a Glance

Name: Seven Cities of Gold

Type
Adventure game

Manufacturer
Electronic Arts
2755 Campus Dr.
San Mateo, CA 94403
(415) 571-7171

Price
$40

Format
Two 5¼-inch floppy disks

Computer
Commodore 64; Atari 400XL, 600XL, 800XL, and 1200XL; Apple II, II Plus, IIe, and IIc; joystick required

Documentation
Game manual, reference card

Audience
Fantasy-adventure fans and young history buffs

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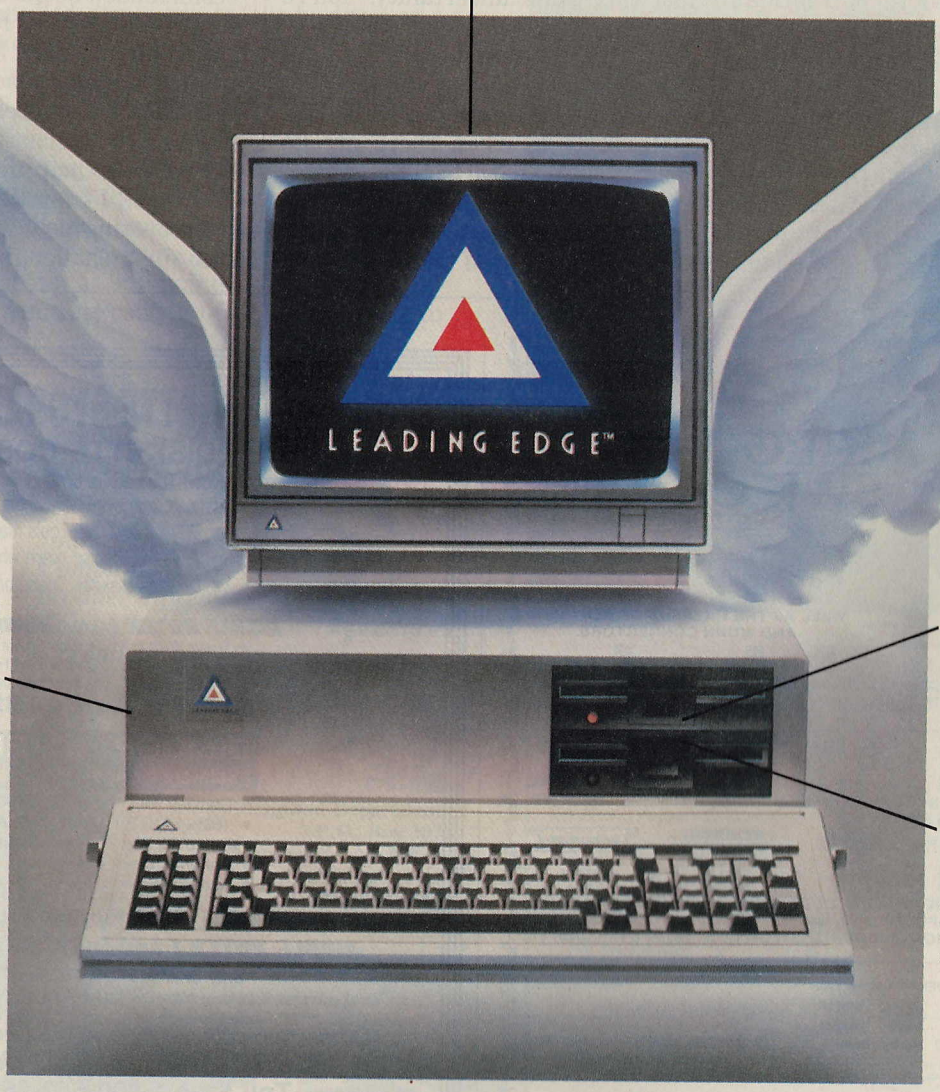

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to the equator than up north, the amount varying with the time of year. As you uncover more pieces of the New World, the game will challenge you with storms, ambushes, food spoilage, and shipwrecks. Your men may even decide to sail away with your ship while you're exploring on land.

Hands-On History

All this realism makes Seven Cities of Gold more than just an absorbing game for adults. It's an unconventional educational tool for young people, too. You never learn that the island south of Florida's peninsula is called Cuba because nothing on the map is labeled. The designers could easily have put labels on the islands you are discovering, but I suspect they felt it would take away from the thrill of discovering uncharted lands. And younger players get a kick out of exploring an area and giving it a name themselves. (Teachers who use Seven Cities with their geography classes might want to supplement the lessons with conventional maps.)

The greatest educational value of Seven Cities comes from its ability to give you a sense of history that a textbook account could never duplicate. When Columbus hit the high seas, he didn't even know where he was going. He had to guess how much of everything to bring along. He had to deal with native Americans (he called them Indians) and a culture very different from his own. When you play the game, you feel this same uncertainty. You're not just reading about the New World, you're there discovering it for yourself, the same way the early explorers did. For example, you quickly learn that, when there are no roads, you can move faster on a river than you can on land. And indeed, the early explorers did use rivers as their main means of transportation.

I encountered only two problems with this complex game. One of them concerns the native Americans, who appear as tiny figures wearing ridiculous-looking headdresses and stomping around with spears. That may have been the way to depict savages in the old Tarzan movies, but today we know better. Programs with even a hint of educational value have to be very careful not to perpetuate stereotypes.

The other problem is with the documentation. The slick-looking booklet contains anecdotes about Columbus and a long bibliography of recommended books on the early explorers, but precious few specifics on how to play or even load the game. And the original loading may take more than 15 minutes of disk swapping as you alternate the program disk and the map disk in the disk drive. Still, I suppose that's all part of discovering new worlds—a small price for a challenging game. □

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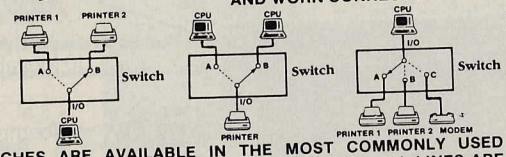

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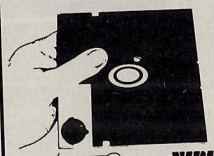

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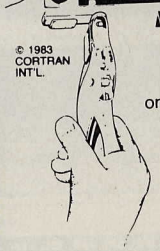

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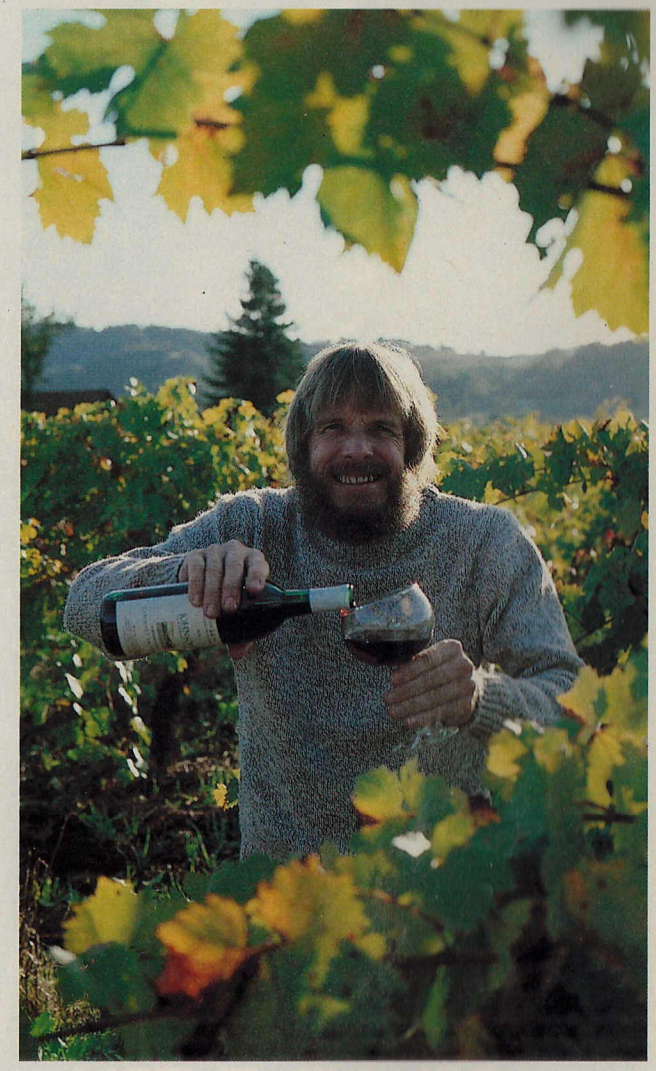

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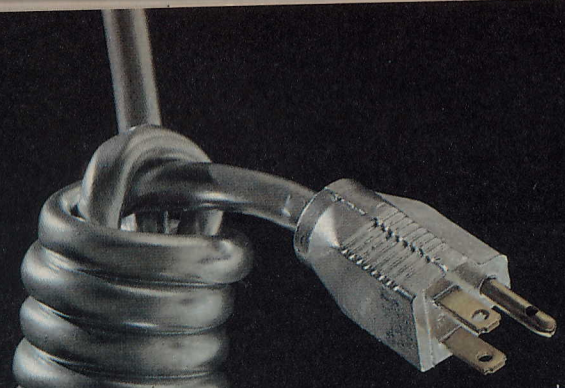

That power cord may look innocent. But it could suddenly turn against your PC.

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NEW SOFTWARE

Business

Custom File is a database manager that combines the ease of use of a simple file manager with the power of a true programmable relational database. Written in assembly language with an interface to BASIC, Custom File can manage 24 files at once, with 10,000 records per file, 500 data fields per record. Data entry forms are designed with a full-screen editor and free-form graphics drawing. A full-functioned report mode is included. For **IBM** computers with at least one 360K-byte disk drive, 256K bytes of RAM, and PC-DOS 2.0; $395 (a demo disk is available for $10). Custom Data, POB 1408, Salt Lake City, UT 84110.

1st Base, a relational file-handling and report-writing system, offers a multifile capability, Boolean conditions, user-defined file formats, automatic generation of data-entry screens, and nested sorts of up to 10 keys. For the **Apple Macintosh;** $195. Desktop Software Corp., CN-5287, Princeton, NJ 08540.

The Librarian List is a collection of nine programs for libraries of all sizes. The package helps administrators with book loans, cataloging, staff information and scheduling, on-line file transfers, mailing lists, and want lists. A text editor facilitates the writing of letters and mailing labels. For the **Apple II** and **IIe;** $150. Andent Inc., 1000 North Ave., Waukegan, IL 60085.

Phone Chek, for small businesses, tracks your monthly phone bills for usage and cost information. For the **IBM PC, XT, PCjr,** and compatibles; $150. Xiox Corp., 411 Borel Ave., San Mateo, CA 94402.

Promis, a network-based project management system, provides planning and tracking for a virtually unlimited number of projects, resource management, and cost-control functions. Features include interactive data entry, sort/select capabilities, graphic and tabular report formats, batch-entry facilities, and more than 40 predefined reports. For the **IBM PC, XT,** and compatibles; $3000. Strategic Software Planning Corp., 222 Third St., Cambridge, MA 02142.

Synthesis, a survey-processing system, lets you create and review questionnaire, organization, and report-format files. The system handles an unlimited number of questionnaires, up to 100 questions per questionnaire, and scale, multiple-choice, and numeric formats. The program includes sum and average indexes and a correlation routine. For the **IBM PC** and compatibles; $595; requires two disk drives. Bauer & Associates Inc., 210 East Huron, Ann Arbor, MI 48104.

dFaster dBetter

dFaster dBetter offers a convenient way to make your dBASE II programs run significantly faster and occupy less disk space. The package consists of a utility disk and a loose-leaf-type book. The utility program, called dProcessor, reformats dBASE II files to make them up to 60 percent smaller and 35 percent faster. The book, called dFacts, *includes additional techniques to further improve dBASE II efficiency. When used together, run times can be reduced by as much as 50 to 75 percent. Requires no dBASE II or hardware modifications. For the* ***IBM PC;*** *$60, disk; $35, book. Micro db Systems, POB 2380, Midland, MI 48640.*

Education

Cave of the Word Wizard is an educational game that uses synthesized speech to teach children basic spelling skills. Players explore a secret cave, spelling words periodically uttered by the mysterious Word Wizard. Includes 500 spoken words, 10 spelling skill levels, and four game skill levels. For the **Commodore 64;** $34.95. Timeworks, 444 Lake Cook Rd., Deerfield, IL 60015.

Class Records 2.3, a record-keeping program for teachers, totals points, converts scores to 90, 80, 70, and 60 scales, and transfers data (including averages) between files. It also prints reports, class lists, and histograms, notes missing assignments, and merges files. For the **Apple II** family; $39.95 (for individuals); $99.95 (with school license). Educator Software, 300 Lilac Dr., Los Osos, CA 93402.

Codon is a game designed for high school and college biology students. From a randomly generated sequence of DNA molecules, it's up to you to logically deduce the proper order of amino acids. Promotes understanding of the Genetic Code Table. For the **Apple II** family and **Commodore 64;** $50 (Apple version); $29.95 (Commodore version). Compress, POB 102, Wentworth, NH 03282.

Crossword Puzzles provides a way to sharpen foreign language skills. The program offers three skill levels and is available in German, Spanish, French, Latin, and Italian. Answers included. For the **IBM PC** and **Apple II** and **IIe;** $49.95. Soflight Software, POB 2223, Encinal Station, Sunnyvale, CA 94087.

Evelyn Wood Dynamic Reader is designed to promote reading comprehension,

New Software provides up-to-date listings of recent releases in microcomputer software. Descriptions are based on information supplied by the manufacturers and are not to be considered endorsements of the products. Companies continually offer new versions of popular programs for different machines. Please check with the manufacturer or a dealer to find out if a program is available for your computer. For in-depth evaluations of some of these programs, see our Software Review section.

retention, and speed. The program offers exercises with adjustable reading speeds and the ability to automatically measure user progress. For the **IBM PC, Apple II** and **IIe, Commodore 64,** and **Ataris;** $89.95 (Apple and IBM versions); $69.95 (Commodore and Atari versions). Timeworks, 444 Lake Cook Rd., Deerfield, IL 60015.

Keys to Responsible Driving is a driver education program for ages 15 and up that emphasizes safe driving techniques and helps you prepare for state motor-vehicle written examinations. You begin with a pretest to measure knowledge about driving skills and regulations. Nine menu-driven sections feature full-color graphics depicting actual driving situations, such as city and town driving, express-way driving, and driving hazards. You are given feedback, and a post-test analyzes your progress. Included is a 32-page Guide to Safe Driving that covers state driving laws, behavior at the scene of an accident, keeping a car in good condition, and definitions of driving terms. For the **Apple Macintosh, Apple II** family, **Ataris, Commodore 64,** and **IBM PC** and **PCjr.** CBS Software, One Fawcett Place, Greenwich, CT 06836.

Law in American History, a two-part series of tutorials, exercises, and simulations, covers famous cases in U.S. legal history. Part I's topics include the Bill of Rights, Brown v. Board of Education, and Tinker v. Des Moines. Part II includes Marbury v. Madison, the Dred Scott case, and antitrust law. Designed for classroom use. For the **IBM PC, Apple II** and **IIe, Commodore 64,** and **TRS-80 Model 4;** $45 each. Intellectual Software, 798 North Ave., Bridgeport, CT 06606.

Pascal Tutor presents the fundamentals of Pascal programming. Includes 500 text screens, 150 questions, and 34 small example programs. For the **IBM PC;** $59.95. Gamma Software, POB 25625, Los Angeles, CA 90025.

Games

Black Stallion is an adventure game that recreates the era of the Old West. Lost in the desert, you must find your way to the safety of a nearby fort. Beware of rattlesnakes, Indian spirits, sandstorms, vampire bats, and other pitfalls. Features high-resolution graphics, music, and sound effects. For the **Apple II** and **IIe;** $49.95. CAC Software Inc., POB 16090, Arlington, VA 22215.

Cutthroats, an adventure game, puts you on the trail of sunken treasure. Join with some of the shadiest characters this side of Davy Jones's locker as you brave the seas and try to cheat death. Package includes a book, map, nautical tables, and other search aids. For the **IBM PC, Apple II** and **IIe, Commodore 64,** and 20 other systems; $39.95. Infocom Inc., 55 Wheeler St., Cambridge, MA 02138.

Golf Championship lets you design your own 18-hole golf course. Features include a selection of clubs, the ability to add a hook or slice to your swing, and automatic scoring. For up to four players. For the **Commodore 64** and **Ataris;** $29.95. Adventure International, POB 3435, Longwood, FL 32750.

Raid on Bungeling Bay is an arcade-type game that puts you behind the controls of a space-age helicraft. Your mission is to destroy the War Machine, an intelligent armada that includes interactive tanks, boats, bombers, and antiaircraft guns. The game features over 100 screens and six different levels. For the **Commodore 64;** $29.95. Broderbund Software, 17 Paul Dr., San Rafael, CA 94903.

Gulf Strike

In this strategy game you are in the midst of a Persion Gulf crisis involving Iran and the Soviet Union. As an armchair general, you control military forces on the land and sea and in the air. For ***Ataris;*** *$30. Avalon Hill Game Co., 4517 Harford Rd., Baltimore, MD 21214.*

Solo Flight is a flight simulator that offers increasingly difficult challenges as your flying skills improve. You can grab a joystick and take off, using 3-dimensional graphics and a slot formation perspective to understand flight positioning. Once you have practiced a bit and developed a variety of flying skills, you can play the Mail Pilot game—delivering the U.S. Mail among different airfields and overcoming obstacles such as deteriorating weather and instrument failures. Simulation options include touch-and-go landings, visual or instrument flying, full cockpit instrumentation, dual VOR navigation radios, instrument landing systems (ILS), multiple air navigation maps, and emergency procedure practice. For the **Apple II** family, **Commodore 64,** and **Ataris;** $34.95. Microprose Software, 10616 Beaver Dam Rd., Hunt Valley, MD 21030.

Skyfox is an arcade-type, single-player game that puts you in control of a Skyfox Mach 4 Federation fighter plane. Your view is from the cockpit of a modern fighter aircraft armed with laser cannons and heat-seeking missiles, pitted against the enemy whose motherships are attacking Federation asteroid bases with aircraft and tanks. The handling ability of your aircraft and the aggressiveness and agility of your opponents increase dramatically as you choose from 15 ranked scenarios and combat tanks, planes, or both in your progress from cadet to ace. For **Apple II** computers; $40 (Apples equipped with a Mockingboard can play the game's sound effects in stereo). Electronic Arts, 2755 Campus Dr., San Mateo, CA 94403.

Suspect, Infocom's latest interactive fiction whodunit, casts you in the role of a newspaper reporter invited to an elegant masquerade ball. Dressed inappropriately as a cowboy, you mingle with blue bloods in the magnificent ballroom until murder halts the festivities. The finger is pointing at you, and you have only a few hours to convince the police of your innocence. Geared to the advanced level, Suspect is available for: **Apple II** computers, **Atari, Commodore 64, Commodore Plus 4, CP/M** 8-inch, **Data General Desktop 10, DEC RT-11, Epson QX-10, H-P 150** and **110, IBM, Macintosh, Mindset, NEC PC-800, Osborne, Radio Shack Color Computer, Tandy 2000, TI Professional, TRS-80 Models I** and **III, MS-DOS 2.0,** and **TI 99/4A;** $45 ($40 for Atari, Commodore 64, and Color Computer). Infocom, 55 Wheeler St., Cambridge, MA 02138.

The Time Machine is an adventure game based on H. G. Wells's classic novel. Travel to the futuristic world of Eloi, where your task is to rescue the fair Weena from the malevolent Morlocks. Features high-resolution graphics

and animation. For the **Commodore 64;** $34.95. Imagic, 981 University Ave., Los Gatos, CA 95030.

Toy Bizarre, an arcade-type game, follows the adventures of Merton, a night watchman at the Gizmo Automated Toy Works. Merton leaps and bounds, madly shuts valves, bursts balloons, and captures toys in an attempt to halt a runaway assembly line. For **Ataris;** $31.95 (disk); $34.95 (cartridge). Activision Inc., 2350 Bayshore Frontage Rd., Mountain View, CA 94043.

Word Hunter, a word-search game, challenges you to find the words in a matrix within a specified time period. Includes many preprogrammed matrices, or you can design your own. The software offers audio and color graphics. For ages 10 and up. For the **Commodore 64;** $14.85 (disk); $9.95 (tape cassette). Sher-Tek, POB 6808, Station J, Ottawa, Ontario, K2A 3Z4 Canada.

Home

Food Processor, a nutrition evaluation system, compares menus, recipes, and daily food intakes to personalized recommended daily allowance profiles. The system is based on USDA data plus over 200 other scientific sources. The database includes 1500 foods and 26 nutrients, including dietary fiber. You can add more foods. For the **Apple II;** $120. ESHA Research, POB 13028, Salem, OR 97309.

Greetingware gives you a choice of Valentine's Day, birthday, or Christmas electronic gift cards on disk, featuring pictures, messages, and sing-along music with lyrics. These 5¼-inch double-sided, double-density disks will run on the **IBM PC** or **XT** with DOS 2.0, advanced BASIC, one disk drive, and a color or monochrome display monitor; $13.95 (for an additional $3, you can include a personalized message). Roxbury Research Inc., RD 1, Box 171A, Roxbury, NY 12474.

Home Address Book remembers names, addresses, phone numbers, birthdays, anniversaries, and a variety of other personal information. The menu-driven program provides password protection, a scanning feature, and the ability to print mailing labels and six types of reports. It keeps track of 32 items for over 400 families. For the **Apple II** family; $19.95. Opt-Systems, 2109 West Edgewood Dr., Jefferson City, MO 65101.

Music Type turns your computer and printer into a music typewriter. The program lets you transcribe notes, chord symbols, and staffs with a single keystroke. It also lets you add lyrics and text to scores. For the **Apple Macintosh;** requires MacPaint software and Imagewriter printer; $49.95. Shaherazam, POB 26731, Milwaukee, WI 53226.

SPR, an electronic spreadsheet, features fully adjustable column widths, commands for configuring spreadsheet size, and serial printer support. The program provides 11 functions, including linear regression and approximation. For the **Radio Shack Color Computer;** $25 (tape cassette). DSN Computers, 37 Stannard Ave., Branford, CT 06405.

Stamp Collector is a database system for philatelists. Six programs enable you to enter, delete, alter, search, sort, and print information in multiple formats. Includes databases for domestic and foreign stamps, meetings, and stamp supply sources. Also provides a telephone file-transfer utility and a free-form, user-defined database. For the **Apple II** and **IIe;** $49. Andent Inc., 1000 North Ave., Waukegan, IL 60085.

Star Cal II, a celestial calendar, displays important astronomical events from the present to 1990, including lunar and solar eclipses, moon phases, annual meteor showers, and oppositions of Mars, Jupiter, and Saturn. For the **IBM PC;** $39.95. Software City, POB 11082, Station H, Nepean, Ontario K2H 7T8 Canada.

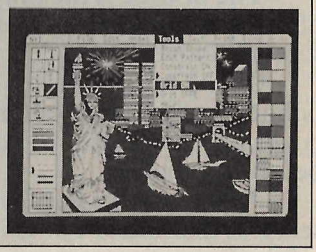
Time Minder is an integrated perpetual calendar, appointment scheduler, and notepad for the home or office. The program gives an instant display of appointments and notes for any date within the current or subsequent year. For the **IBM PC, PCjr,** and compatibles; $45. Useful Software Inc., POB 24125, Minneapolis, MN 55424.

Graphics

DFD Draw helps with the creation of data-flow diagrams. The program contains a complete template of graphics symbols you can interactively position, connect, and annotate. Diagrams can be enlarged or reduced with scaling and sizing functions. Pan and zoom features permit easy editing of even large-scale diagrams. For the **IBM PC** and **XT;** $500; requires color-graphics adapter. McDonnell Douglas Automation Co., St. Louis, MO 63166.

Color Paint

This graphic-design program lets you create full-color, freestyle artwork. Features include a 16-color palette and a variety of brush styles and patterns. You can move images around the screen and transfer them into other drawings. Supports mouse input and printer output. For the ***IBM PCjr;*** *$99; cartridge. IBM, Entry Systems Division, POB 1328, Boca Raton, FL 33432.*



Dr. Halo is an easy-to-use, mouse-driven graphics editor. The program includes circles, squares, ellipses, and filled and unfilled rectangles. It also offers numerous colors and hatches plus several type fonts, including the Greek alphabet. Supports Microsoft and Summagraphics mouse systems as well as several kinds of digitizers. For the **IBM PC** and compatibles; $99. Lifeboat Associates, Dept. C, 1651 Third Ave., New York, NY 10128.

Languages

AQL (Appgen Query Language), an English query language designed for commercial applications, allows highly flexible sentence structures with relatively free-form input of word order and syntax. AQL provides automatic or user-specified-output report formats, generalized data selection using logical and arithmetic relationships, and a sophisticated sorting capability. For **Unix-** and **Xenix-based** systems; $695. Software Express, 2925 Briarpark Dr., Houston, TX 77042.

High Performance Level-II COBOL compiler provides powerful file-handling capabilities, fast compilation (typically more than 1000 lines per minute), and an 8088 native code generator. It is GSA-certified to the federal high-level ANSI 74 COBOL standard with zero errors. For the **IBM PC;** $1995. Micro Focus Inc., Suite 400, 2465 East Bayshore, Palo Alto, CA 94303.

IEM FORTRAN 77 is an implementation of the popular,

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long-lived scientific programming language. The compiler is designed to offer Hewlett-Packard computer users high speed plus extensive graphics and I/O capabilities. For the **HP Series 200;** $1200; demonstration disk, $25. International Electronic Machinery Inc., POB 1818, Fort Collins, CO 80522.

Technical Tools

Filesafe encrypts files into unbreakable, unintelligible gibberish, protecting proprietary information and sensitive or confidential data from prying eyes. You supply your own secret key phrase. For the **IBM PC** and **XT;** $95. Safe Software Inc., POB 718, Dover, MA 02030.

Kwik Load boosts your Commodore DOS loading and copying speed by three to four times. It also includes an editor that lets you rename, delete, and validate disks. Formats disks in 10 seconds. For the **Commodore 64;** $19.95. Datamost Inc., 20660 Nordhoff St., Chatsworth, CA 91311.

Macro-Toolkit provides Lotus 1-2-3 users with a variety of useful keyboard macros. The system can reconfigure data from row-to-column or column-to-column formats, automatically insert day, month, or quarter label headings, and print formatted labels from a Lotus database. For the **IBM PC** and compatibles; $29.95. Micro Realities, POB 60123, Grand Junction, CO 81501.

Megasort, a binary sort routine, reads any file from a user-specified drive, sorts the data using temporary files, and then rewrites the original file. The system also indicates the free space required for sorting as well as the expected length of time the sort will require. For the **IBM PC, XT,** and **PCjr;** $75. Application Innovations, 1550 Old West Henderson Rd., Columbus, OH 43220.

Mini BBS, an electronic bulletin board program, offers password security, electronic mail, and multiple boards and levels. Also includes help files and sysop utilities. Supports Hayes Micromodem II/IIe or Novation Apple Cat 2. For the **Apple II** and **IIe;** computer must be capable of running ProDOS; $75. Outstanding Software Corp., POB 490, Franklin Square, NY 11010.

Profix allows owners of DOS 3.3-specific software to use an Apple Profile hard-disk system without converting to ProDOS. You have the option of mapping portions of your hard-disk unit with DOS 3.3, while reserving other areas for ProDOS or Pascal. Configures the Profile with up to 34 143K-byte volumes. For the **Apple II** and **IIe;** $59.95. Nordic Software Inc., 4910 Dudley St., Lincoln, NE 68504.

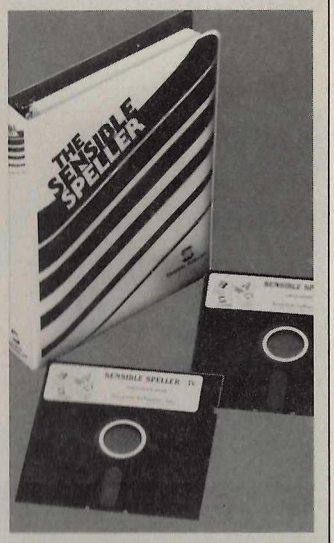
Screen Format+/Menu Maker+ are a pair of BASIC programming utilities. Screen Format+ is a screen generator that makes your programs look neater and more attractive. Menu Maker+ is a menu framework generator that lets you create menu-driven starter programs. For the **Apple II** and **IIe;** $29.95. Blash Inc., 3612 Pandola Ave., Joliet, IL 60435.

Wylbur PC 2.0 is a program-development system. It helps you design integrated software packages, computer-aided instruction (CAI) programs, order-entry systems, and many other types of application programs. Communicates with TSO, OBS, WYLBUR, CICS, VM/CMS, and other mainframe systems. For the **IBM PC** and compatibles; $550. OBS Software, 115 Sansome St., San Francisco, CA 94104.

Word Processing

Allwrite offers word processing with two-key English-like commands. It also provides right-justified proportional spacing and a help library covering over 50 subjects. The program supports the Electric Webster 1.7 spelling checker and the Dotwriter 4.0 graphics/text formatter. For **Radio Shack TRS-80 Models I, III, 4,** and **4P;** $249.95. Prosoft, POB 560, North Hollywood, CA 91603.

Sensible Speller for ProDOS



This spelling checker works with virtually all ProDOS-based word-processing programs and integrated software packages. It displays misspelled words in context, suggests correct spellings, and immediately corrects misspelled words with automatic upper/lowercase adjustment. Contains over 80,000 words from the Random House Dictionary. *For the **Apple II** family; $125. Sensible Software Inc., 24011 Seneca, Oak Park, MI 48237.*

Max Think is a word processor that includes commands and structures for gathering, classifying, dividing, joining, and sorting words and ideas. For the **IBM PC** and compatibles; $249. Max Think, 230 Crocker Ave., Piedmont, CA 94610.

Professional Writer's Package includes a text editor, document formatter, spelling checker, and index generator. The text editor offers multiple windows and allows you to edit up to 12 files simultaneously. The spelling checker includes a 43,000-word dictionary. For the **IBM PC, TI Professional,** and **DEC Rainbow;** $490. Emerging Technology Consultants, 1877 Broadway, Boulder, CO 80302.

WS-Print offers Wordstar users a variety of useful printer functions. Features include true boldfacing and underlining, double and wavy underlining, user-defined character sets, italics, microjustification, and the ability to mix narrow, wide, and normal-width text on a single page. It also executes and provides additional Wordstar dot commands. Works with the popular Epson MX series, RX series and FX-80, Okidata ML-92, and C. Itoh 8510-A/Prowriter dot-matrix printers. For **CP/M-, MS-DOS-, PC-DOS-,** and **Z-DOS-based** systems; $39.95. Wheatland Design Laboratory, 2601 Belle Crest Dr., Lawrence, KS 66044.

Zyindex, a full-text search program, lets you access any word or phrase in up to 15,000 files within seconds. The program provides Boolean searches, marks and saves retrieved text, and supports foreign languages. Works with both hard and floppy-disk systems and most popular word processors. For **MS-DOS-based** systems; $145 (Standard version: scans up to 1500 files at a time); $295 (Professional version: scans up to 15,000 files at a time). Zylab Corp., 233 East Erie, Chicago, IL 60611. □

A wide-ranging look at ways to get more from your personal computer

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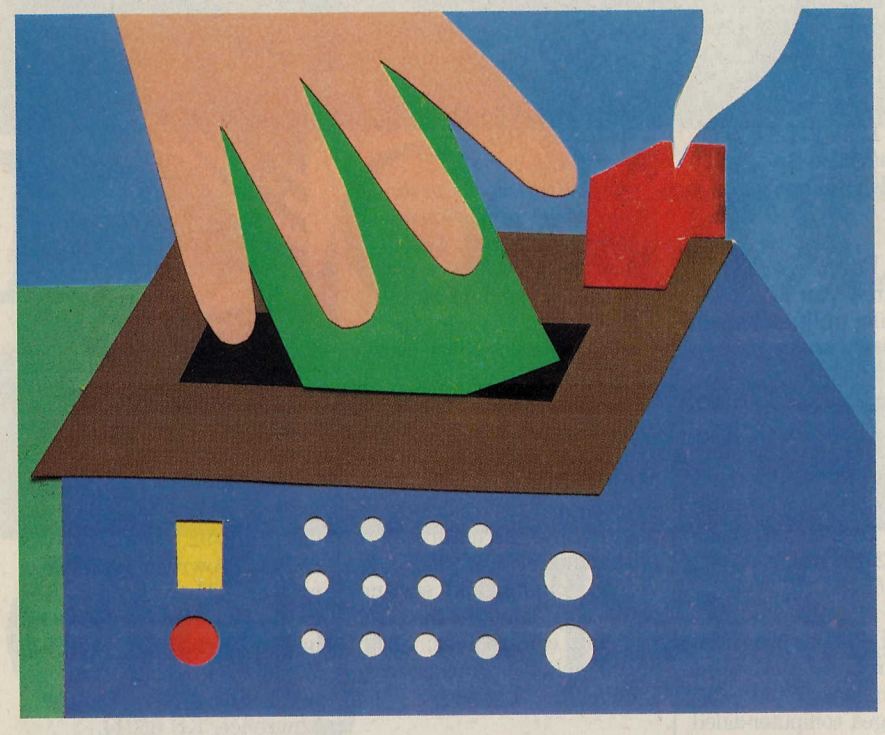
An Orderly Approach Gets the Bugs Out Page 161

Technoklutz's Strategy for Blitzing the Booths Page 163



Digital Trip to the Bank Saves Time, Avoids Traffic

About 25,000 Californians don't bother to balance their checkbooks. And unlike some of the rest of us who follow that practice, they seldom get an overdraft. Instead, these personal computer users let the Bank of America in San Francisco do the calculating. There are no surprises from the checkbook because the bank computer instantly updates accounts with each transaction. At any time of day or night, these customers can pay bills electronically in less time than it takes to stamp a batch of return envelopes. They can transfer funds and get the latest rates on savings and loans. They can even apply for a loan or purchase a certificate of deposit. About the only thing that requires a trip to the bank is depositing or withdrawing cash.

Bank of America's highly successful Homebank, in operation for more than a year, is one of about 40 home banking services in the United States. Chemical Bank in Manhattan offers Pronto, similar to Homebank, and has licensed its use to eight banks in other areas. National Bank (Detroit, MI) and Empire Bank (Buffalo, NY) run their own systems. Other banks are serving their customers through Viewtron (Miami Beach, FL), Videotex America's Gateway (Santa Ana, CA), Keycom's Keyfax (Schaumburg, IL), and Compuserve (Columbus, OH). Seventeen banks are participating in Home Banking Interchange, an experimental national network developed by ADP/Telephone Computing Service in Seattle, Washington.

Worldwide customer response is strong. European banks in several countries offer home banking over government-developed, national home videotex systems. Home banking is available in Hong Kong and is coming soon in Japan, Australia, and New Zealand. The Banco Popular in Quito, Ecuador, is building a multiservice home videotex system to reach more than 80 percent of that country's population.

Here and abroad, the appeals are the same. Customers like the convenience, and bankers appreciate the reduction in paperwork, data entry, and office traffic.

Approaches Differ

Although the services are similar, approaches to home banking differ.

Illustration by Ivan Chermayeff

Bank-owned systems are characterized by concentration on banking services, low user fees, and an ASCII format compatible with most home computers. But some banks, reluctant to enter the communications business, have contracted with multiple-service home communications systems. In this case, home banking is on the menu along with the news and other features. Banking is an important addition to such a system. In several home videotex trials, its popularity has been second only to the news.

Other banks favor a third approach. They view home banking as the first step toward a full-service communications system of their own. Home Banking Interchange, in fact, is a market trial of such a system. In addition to banking, it includes electronic news, shopping, and games.

The future of full-service systems is difficult to predict. Some observers point to high costs and low subscriber interest; others see a profitable and viable mass medium. But home banking, with its benefits for both customer and institution, seems certain to grow. In 2001, lines at the teller's window may be only a memory. —G. Berton Latamore

An Orderly Approach Gets the Bugs Out

You've spent 10 hours a day for the past week struggling with your program, and blisters are sprouting on your fingertips. At last you're finished. But when you type in RUN, the screen explodes into a bizarre rainbow of colors, numbers shoot up and out of sight, buzzers blare, and error messages chase your cursor off the screen. Obviously, something is wrong.

By far the most common mistakes that both programmers and readers who copy program listings make are typographical errors. Luckily, most versions of BASIC have error messages that actually stop at the line where you've blundered to make hunting for typos easier. So the first thing you should do with a program that bugs out is correct those lines that your computer tells you are wrong. Make sure that all BASIC statements are in uppercase (if your computer requires this); that the correct PRINT statements are opened and closed by quotes; that you haven't put a letter where a line number should be; and that you haven't mistaken colons for semicolons, Os for zeros, Ls for ones, and so forth. Also remember that PRINT 2+5 is not the same thing as PRINT "2 + 5". The first prints 7 on the screen, the second 2+5.

If you're still having a hard time perfecting the program, major changes may be needed. To ensure that you don't destroy all you've done, save your program on cassette or disk so you'll always have your original in case you make things worse as you try to fix them.

Next, if you have a printer, print out the entire listing. A printed listing will make it easier to search through your program and check BASIC statements that refer to other program lines, such as GOTO, IF...THEN, READ, and DATA.

Make a Flowchart

Now go through the program line by line. If you haven't already made a flowchart, create one as you go along. Making a flowchart will force you to trace your program's development and check its logic.

As you do this, look carefully at FOR-NEXT loops and GOTO, GOSUB, READ, and DATA statements. When you find mistakes, correct them both on your printout and on the computer. Specifically, ask yourself the following questions:

- Do all GOTO and GOSUB statements actually go to the correct line number? This type of mistake is frequently made when you change the line numbers while copying programs from magazines. As a general rule, type in the line numbers exactly as they're printed, even if you want to alter the program or delete miscellaneous REM and PRINT statements.
- Do all the subroutines have RETURN statements? Does the program as a whole have an END statement? Take a look at this short program, for example:

```
10 PRINT "WHAT A JOB!"
20 GOSUB 500
30 PRINT "IT'S ALMOST OVER."
40 END
500 PRINT "I'M HAPPY THAT"
510 RETURN
```

When this program is run, it prints

```
WHAT A JOB!
I'M HAPPY THAT
IT'S ALMOST OVER.
```

But what if you had forgotten the END statement at line 40? The program would print I'M HAPPY THAT a second time and then stop, telling you that there was an error.

- Is there a comma after each DATA statement member? Is the number of DATA statements correct, and is the data in the correct order? Remember that in READ and DATA routines, the program pointer always moves consecutively to the right.
- Is every FOR paired with a NEXT statement? Do all inner loops end before outer loops? Remember that an inner or nested loop must be terminated before an outer loop.
- Are all variables legal? Have any BASIC reserved words been used as variables? Most versions of BASIC will give you an error if a BASIC reserved word is embedded in a variable. What's more, many versions

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read only the first two letters of a variable. Let's look at a very simple illustration:

```
10 MODELS = 5
20 MOTELS = 10
30 PRINT MODELS * MOTELS
```

When run on my Atari 800, this program prints 50. But on my TRS-80 Model I, the product is 100 because its BASIC interprets MODELS and MOTELS as the same variable—the computer reads only the first two letters, multiplying MO (which becomes 10 in line 20) by MO to produce 100. My NEC lap computer yields yet another response: SYNTAX ERROR in 10. In its BASIC, MOD is a reserved word and MODELS is therefore an illegal variable.

•Are the numerical values used with CHR$, ASCII, POKE, and PEEK functions correct? When using POKE, remember that 10 POKE 1801,6 stores the number 6 in memory location 1801, not 1801 in memory location 6.

Leaving a Trail

If you're still having problems, try a trick that many experienced programmers use: insert PRINT statements at strategic spots in your program. This will let you actually see where the program is going as it runs.

For instance, if you suspect that your error is in a subroutine, type in PRINT "ABOUT TO GOSUB" right before the GOSUB statement. In the subroutine, insert the statement PRINT "IN SUBROUTINE". Place another PRINT statement after the program line where it should return. Here's a simple example:

```
10 PRINT "WHAT A JOB!"
15 PRINT "ABOUT TO GOSUB"
20 GOSUB 500
25 PRINT "RETURNED FROM MY GOSUB
   TRIP"
30 PRINT "IT'S ALMOST OVER."
40 END
500 PRINT "I'M HAPPY THAT"
505 PRINT "IN SUBROUTINE"
510 RETURN
```

The extra PRINT statements (lines 15, 25, and 505) not only tell you where your program is going but also let you know when it gets there. If the PRINT statements you've added flash by too quickly, insert another line number with the word STOP after it. When the program stops, typing CONT will get you to the next STOP command. In this way you can very slowly and methodically trace your program. Use the PRINT, STOP, and CONT technique in loops, GOTO statements, or anywhere you think your program might be going out of whack.

If a program seems to be working but is not calculating properly, use PRINT and STOP to print variables as they make their journeys through the program. This will make mathematical errors more obvious—if you've accidentally put a plus sign where an asterisk should be, you're more likely to spot the error if you see it immediately after it occurs. Also watch the order of calculation: PRINT 5*(3+5) does not equal PRINT 5*3+5.

Throughout the entire process, you'll do well to check your computer's BASIC manual. You might discover that your version of BASIC has a few specific debugging features. Many BASICs have error codes that can tell you exactly what's wrong with a program line. Some have trace functions that print program line numbers as your computer executes them. Some versions will allow you to run a program from any line number or use an ON ERROR GOTO statement to run a program even if there is an error.

If you're still stymied after all of this, you might want to contact a computer user's group for help. Even if the group doesn't focus on your system, call anyway. Chances are you can get in touch with an experienced programmer who'll be willing to figure out your problems.

Also, several computer companies provide toll-free numbers to help their users. These can be valuable sources of information, as can good computer stores.

If you're having problems with a program you've copied from a magazine, there could very well be a typo in the printed listing. Be on the lookout for a correction in the next issue.

Finally, keep in mind that debugging is a normal part of the programming process. True, it can be awfully frustrating, but that frustration is proportional to the satisfaction of getting the bugs out and seeing the program perform the task it was designed to do. —Seth Greenberg

THE TECHNOKLUTZ CHRONICLES

A BASIC Strategy For Blitzing the Booths

My friend the Technoklutz goes to a lot of computer shows. Why? Because he wants to learn about the revolution that's changing our society. And although he doesn't have a terrific history with mechanical objects, he figures that's because typewriters and cars and screwdrivers were around before he was and everybody else got a head start on him. He isn't going to let that happen again.

But the trouble with those giant computer shows, as he's quick to tell you, is that there are miles of aisles and piles of people. Either you embark on an inefficient march through the convention hall, seldom pausing to rest or browse, or else you scrawl little notes to yourself listing what booths you must visit, then zigzag from one to another, longing for a North Star.

Stephen Banker's "Technoklutz" commentaries can be seen on the Public Television series *The New Tech Times.*

The Technoklutz decided to take the matter in hand at the National Computer Conference in Las Vegas last summer.

He has one of those briefcase computers not much bigger than a book. It has a tiny printer built in and, despite its size, a normal keyboard, perfect for typing in moving vehicles. That's what he used it for until the convention question came up, and then in a rare lucid moment, he realized that the thing understands a language called BASIC.

A BASIC Brainstorm

Now, time out: the Technoklutz is not one of your weirdo computer nerds. He's a humanist, a poet, a partisan of mankind against mechanization. All he knows about BASIC is that every line in that language starts with a number. You can enter the items haphazardly and the computer sorts them out. You put in 4,2,1,3 and it comes out 1,2,3,4. No big deal for something that cost close to a thousand bucks, but he saw a special use for that function.

When he received the conference program, he turned immediately to the exhibitor listings. The problem was obvious: the organization was alphabetical and had nothing to do with where anyone was. IBM, booth C3930, was listed next to IBEX, booth A2126. Apple, C4466, was next to Applied Circuit Technology, H204. The Technoklutz locked his door, drew the blinds, and activated his scheme. When an exhibit caught his interest, he typed the number of the booth, a space, the name of the exhibitor, and a reminder of why he was interested.

At the end, he gritted his teeth and typed "LIST." A swirl of numbers and letters flashed by on the small display—a useless blur. Undaunted, he consulted his manual, scrunched up his toes, and typed "LLIST." *Yes!* With the buzz of swarming mosquitoes, on skinny grocery-receipt paper, there it came: unscrambled, ineffably logical, and adorably consecutive—a totally efficient parade route through the Las Vegas Convention Center.

His progress through the center, he told me and I'm pleased to report to you, was orderly and dignified. He got home from Las Vegas with 433 plastic shopping bags, a T-shirt, a tennis visor, and a plethora of business cards from people to call if he ever gets to northern California.

Finally, there was the knowledge that he had done something real with a computer, a joy the Technoklutz hadn't expected quite so quickly in his apprenticeship. He understands that any BASIC-running computer can simplify logistics the same way his did, but, at last sighting, he was still clutching his little miracle-worker and waiting for a call from the Pentagon.

—Stephen Banker

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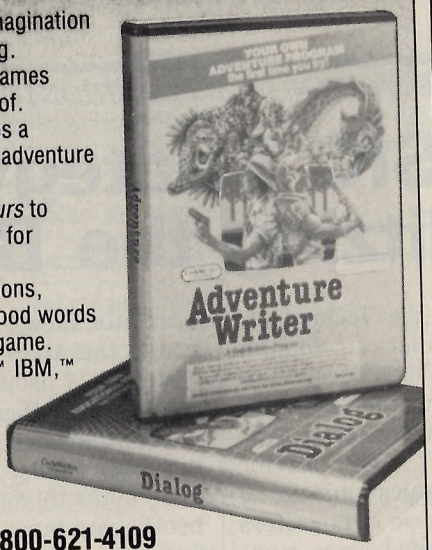

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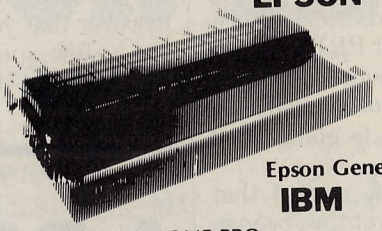

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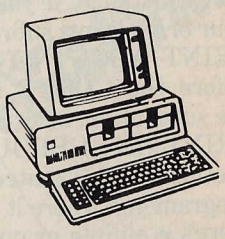

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Letters Into Numbers

by Michael W. Ecker

This month's challenge involves the functions ASC and CHR$, which essentially are inverse operations in your computer's BASIC language. Both operations are mathematical "functions": a function is a correspondence between elements in two sets, or well-defined collections, where to each element in the first set there corresponds precisely one in the second. As a simple example, the first set could be all persons in the United States and the second could be all positive real numbers. Then we could assign each person a number representing his or her weight. Hence, weight would be a function. An important point: nothing in the definition of function says that different inputs must have different outputs. Persons A and B in the first set might have the same weight, for example.

Mathematics students are more familiar with functions in formula form, such as $y = 2x$: for each number x there is a corresponding number y, in this case found by doubling x.

But back to BASIC. CHR$, an important function, assigns a single keyboard character to each positive integer in a set of 1 to 255. For example, CHR$(65)="A", CHR$(66)="B", and so on. Each number has a corresponding character, and different numbers have different characters.

We can reverse the procedure and assign a positive integer to each keyboard character, and the ASCII function ASC does exactly that. ASC(A)=65 and ASC(B)=66. In the language of mathematics, CHR$ and ASC are inverse functions.

Now that I've sneaked in a math lesson, on to programming fun. You can use various BASIC commands to find the total ASCII values of strings by adding the values of individual numbers and characters. For instance, we can define the total ASCII value of "ABC" as 65 + 66 + 67 = 198. The total ASCII value of "123" would be 49 + 50 + 51 ≐ 150. Remember that you can work with numbers by turning them into strings first.

Here's the first challenge. Write a program to find the smallest number and all other numbers that equal the sum of the ASCII values of their individual digits. Second, write a program that allows you to input any number, then find all other numbers with total ASCII values equal to the input number. Try this with inputs of 100 and 200.

You should observe some interesting patterns. Can you see why most input numbers will not be solutions?

A Surprising Solution

Last month's problem was to find the average number of ways a positive integer can be expressed as the sum of two squares, working with the equation $A^2 + B^2 = N$. When you run the program listed above, you'll be amazed to find that in the long run the answer is pi: 3.14159265. . . . This is proved in Ross Honsberger's excellent book, *Ingenuity in Mathematics* (Mathematical Association of America, 1975). □

Author's Note: I welcome comments and actively solicit new problems, with your solutions. Enclose a self-addressed, stamped envelope if you wish a reply. Address all correspondence to Dr. Michael W. Ecker, Contributing Editor, *Popular Computing*, 129 Carol Dr., Clarks Summit, PA 18411.

```
10 PRINT "Count the number of ways to express"
20 PRINT "N as the sum of two squares:"
30 PRINT "      N = A X A  +  B X B"
40 PRINT "and calculate average number of ways"
50 PRINT "for N=0 to ?"
60 PRINT
70 INPUT "Enter upper limit for N ";UL
80 IF UL<0 THEN 10
90 LET MQ=INT(SQR(UL)+.5)
100 DIM SQ(MQ)
110 FOR J=0 TO MQ
120 LET SQ(J)=J*J
130 NEXT J
140 LET CU=0
150 FOR N=0 TO UL
160 PRINT "Trying N=";N
170 LET EQ=0
180 LET J=INT(SQR(N)+0.5)
190 FOR A=-J TO J
200 FOR B=-J TO J
210 LET X=SQ(ABS(A))+SQ(ABS(B))
220 IF X<>N THEN 250
230 PRINT ;A;" X ";A;"  +  ";B;" X ";B
240 LET EQ=EQ+1
250 NEXT B
260 NEXT A
270 PRINT "Found ";EQ;"ways."
280 LET CU=CU+EQ
290 PRINT "Cumulative avg.=";CU/(N+1)
300 PRINT
310 NEXT N
```

Integer Surprise solution (above); sample run (below).

```
Count the number of ways to express
N as the sum of two squares:
      N = A X A  +  B X B
and calculate average number of ways
for N=0 to ?

Enter upper limit for N ? 4
Trying N= 0
 0  X  0   +   0  X  0
Found  1 ways.
Cumulative avg.= 1

Trying N= 1
-1  X -1   +   0  X  0
 0  X  0   +  -1  X -1
 0  X  0   +   1  X  1
 1  X  1   +   0  X  0
Found  4 ways.
Cumulative avg.= 2.5

Trying N= 2
-1  X -1   +  -1  X -1
-1  X -1   +   1  X  1
 1  X  1   +  -1  X -1
 1  X  1   +   1  X  1
Found  4 ways.
Cumulative avg.= 3

Trying N= 3
Found  0 ways.
Cumulative avg.= 2.25

Trying N= 4
-2  X -2   +   0  X  0
 0  X  0   +  -2  X -2
 0  X  0   +   2  X  2
 2  X  2   +   0  X  0
Found  4 ways.
Cumulative avg.= 2.6
```

Dr. Michael W. Ecker is an associate professor in the Department of Mathematics and Computer Science at the University of Scranton.

Looking Back

Providing entertainment and insight, new books document industry history

Hypergrowth
Adam Osborne and John Dvorak
Idthekkethan, Berkeley, CA, 1984
204 pages, cloth $19.95

Woz: The Prodigal Son of Silicon Valley
Doug Garr
Avon, New York, 1984
155 pages, paper $2.75

Up and Running: Adventures of a Software Entrepreneur
Charles T. Sherman
Ashton-Tate, Inglewood, CA, 1984
300 pages, paper $13.95

The Coming Computer Industry Shakeout
Stephen T. McClellan
John Wiley & Sons, New York, 1984
349 pages, cloth $19.95

Reviewed by Mike Nicita and Ron Petrusha

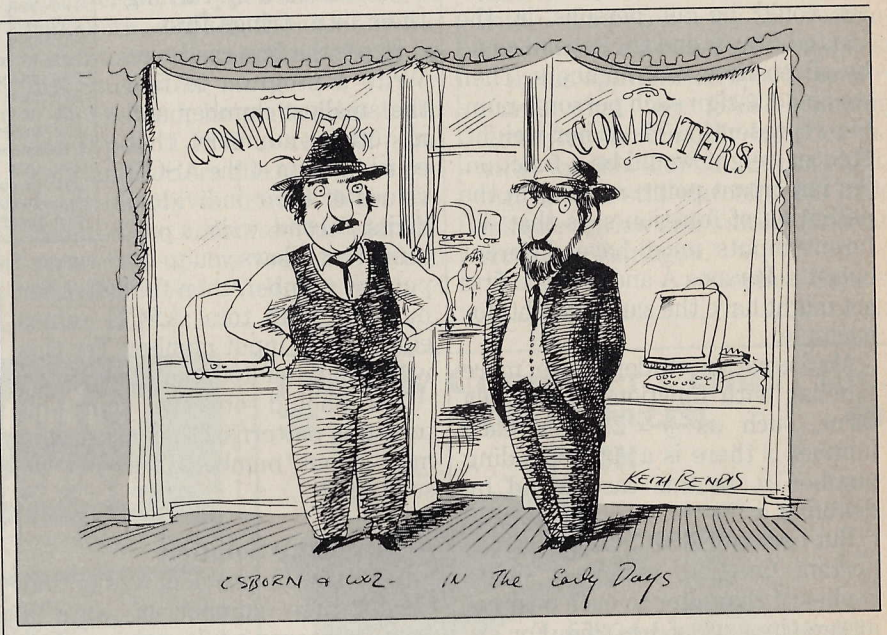

Illustration by Keith Bendis

Eccentricity has always made good copy. Adam Osborne, a man who realizes the impact of a few choice words, is in top form when he observes in the first chapter of *Hypergrowth* that "the microcomputer industry has always been full of eccentric personalities. . .few of its leaders would likely have been voted 'most likely to succeed.'"

And yet they did succeed, and succeed wildly. The books that we've reviewed recount these successes, these eccentricities, along with speculations about the future of the industry. Though the depth and approach of each analysis differ, each book makes a contribution to the general history of microcomputing, a history bound, at this stage, to the stories of a handful of prime movers.

His Own Story

Since the days in 1975 when he would hawk copies of *An Introduction to Microcomputers* to members of the Homebrew Computer Club, Adam Osborne's penchant for self-promotion has become well established. *Hypergrowth* is his side of the headline-grabbing collapse of the Osborne Computer Corporation. It is fascinating not only for its rare glimpse of life in the eye of an entrepreneurial hurricane, but also for its debunking of many of the myths that still surround the OCC demise.

Osborne will probably be best remembered as the manufacturer of the first portable computer. The genesis of this idea, and its evolution into a major marketing success, is one of the book's important stories. But another is the consequence of Osborne's creation of two separate entities—one a machine, the other a corporation. As his narrative progresses, the corporate saga—populated with wary venture capitalists, draconian corporate managers, and overly resourceful accountants—moves to the fore. Soon there are no

Mike Nicita and Ron Petrusha are coauthors of *The Reader's Guide to Microcomputer Books*, 2nd ed. (Golden-Lee, 1984).

heroes, only ordinary people guilty of different levels of malfeasance and villainy, and to this group Osborne himself begrudgingly admits membership.

The authors' account is laced with Supercalc-generated reports that chart the phenomenal growth of OCC and also substantiate the book's major revelation: that a combination of poor market conditions and failed corporate machinations, not the pre-announcement of the Osborne Executive, was the true cause of the company's collapse. Part postmortem, part apologia, *Hypergrowth* gives us a thoroughly informed perspective on the short, spectacular life of the Osborne Computer Corporation. Behind his meticulously crafted image as a consummate showman, Adam Osborne is a complex technician and business manager. His readable account of a major business loss is every *Hypergrowth* reader's gain.

Mythologizing Woz

If notoriety has been one of the motive forces in Adam Osborne's career, biographer Doug Garr would have us believe that "pranksterism" is the Steve Wozniak equivalent. Woz plants a phony electronic bomb in high school, builds illegal "blue boxes," and circulates publicity fliers promoting nonexistent microcomputers. Wozniak's story provides an intriguing foil to Osborne's—though both began their careers as engineers, Osborne was quickly seduced by the business of computing while Wozniak, apropos his prankster style, took refuge in his work when faced with serious business complexities.

Myths play important roles in both books. In *Woz*, Garr goes to great lengths to emphasize that it is Wozniak's genius, and Wozniak's genius alone, that is responsible for Apple ROM, Integer BASIC, disk drives, and revolutionary color and graphics capabilities. The author recreates minor tableaux around the construction of the first prototypes, the formation of Apple Computer, and Wozniak's subsequent lack of interest in corporate politics. Though Garr recounts Wozniak's personal problems and some of the motives for his well-publicized rock concerts, little new insight is offered.

Woz turns out to be an inexpensive, entertaining biography of one of the most gifted microcomputer designers in the industry's brief history. Garr's account, however, though crammed with minute personal detail, never rises to the level of understanding and wit evident in Osborne's first-person narrative.

Software Scene

Against the backdrop of the fall 1983 Comdex show in Las Vegas, Charles Sherman's *Up and Running* presents a series of interviews of software tycoons and would-be tycoons. These individual portraits neatly interlock to form a larger picture of the current software marketplace.

Sherman begins with a capsule history of microcomputing that includes his "asymptotic growth curve" for the software industry (which, coincidentally, is the same mathematical function used by Osborne to describe "hypergrowth" companies). This history treats the general evolution of microcomputers and outlines the current relative positions of each of the major software vendors.

But the book really gets rolling with the interviews. Bill Gates of Microsoft waxes nostalgic. Gary Kildall of Digital Research, besides straightening out what really happened when IBM approached third parties for an operating system, also offers some significant comments about "doing things with AT&T." Mitch Kapor of Lotus gives advice about the importance of a solid business plan in securing capital for any new venture.

Also in Sherman's gallery are some of the lesser known names in the software marketplace. The variety of viewpoints shows the continuing vitality of a new industry, but the diversity of these individual glimpses finally fades as an overall image of the software marketplace emerges. *Up and Running* combines the first-person authenticity of *Hypergrowth* with the detached detail of *Woz*, giving a lively, accurate vision of what it takes to succeed in this highly competitive industry.

Looking for the Future

In *The Coming Computer Industry Shakeout*, Stephen McClellan is less interested in documenting the past for posterity than he is in identifying historical trends in order to predict future winners and losers. "A shakeout is inevitable," he writes, "and not just the widely predicted shakeout at the low end of the market...The shakeout we are talking about is one that will rattle the cages of industry from top to bottom." Despite some problems with the integration of its topics, McClellan's book serves as a valuable first step toward an analytical history of the computer industry.

McClellan stresses an apparently cyclical process in the industry's development: concentration (when only a few manufacturers produced costly mainframes for a very limited market) leads to fragmentation (the current state of the industry) before swinging back to concentration (when companies most successful at integrating their products will stand the greatest chance of success). The general factors producing this dynamic—especially market segmentation, specialization, and a growing division of labor—are also clearly identified, although some of the causes either are patently apparent ("too many companies are selling too many products") or are not carefully related to the general development of the industry.

In addition, McClellan's concern with harnessing history in the interest of profitable investments taints his view of the past. Factors determining success are often unrelated to McClellan's more general analysis (as in his discussion of styles of management) and are almost invariably contradicted by the preeminence of IBM, a "winner" whose continued dominance McClellan assumes but cannot explain. His

case histories, though they make for stimulating reading, are far too individualized to meet the book's broader purpose. As if abandoning his analysis when it begins to lose coherence, the author closes with 15 simple formulas for selecting winning companies—formulas that have little or nothing to do with the preceding material.

But even with these weaknesses, *The Coming Computer Industry Shakeout* stands as a pioneering attempt to synthesize the recent history of the computing industry. In moving beyond simple description to provide an analysis of factors at work in the development of the industry, McClellan's work, though flawed, remains both provocative and rewarding. □

Learning With Logo

Daniel Watt
Byte Books/McGraw-Hill
New York, 1983
256 pages, paper $19.95

Discovering Apple Logo

David D. Thornburg
Addison-Wesley
Reading, MA, 1983
176 pages, paper $14.95

1, 2, 3 My Computer & Me

Donna Bearden
Reston Publishing Co.
Reston, VA, 1983
99 pages, paper $10.95

Apple Logo Primer

Gary G. Bitter and Nancy Ralph Watson
Reston Publishing Co.
Reston, VA, 1983
206 pages, paper $14.95

Reviewed by Tim Riordon

The development of the Logo programming language has spawned a number of tutorial guides—not because the language requires extensive documentation, but because its potential is so exciting to explore. In this review, we'll take a look at four of the best Logo guides.

Daniel Watt's *Learning With Logo* successfully addresses two different audiences at once. Its nontechnical, conversational style, especially in the early chapters, makes it ideally suited to young children who are learning Logo with a bit of help from a teacher or parent. Later chapters are somewhat more advanced, written with high school students in mind. But throughout the book are independent "Helper's Hints" designed to aid teachers or parents. Anyone who knows Logo and is helping someone else learn it will benefit tremendously from these tips from a gifted and experienced teacher. They reveal the hidden side of Logo, showing us that it is not just a programming language but also a marvelous educational tool. Watt's careful design makes *Learning With Logo* as close to all things for all people as any one book could be.

Getting Started

The first part of *Learning With Logo* uses over 150 illustrations and cartoons to complement clear instructions on getting started, drawing simple graphics, writing procedures (as Logo programs are called), and developing larger projects from subprocedures. Watt's many suggestions for activities could keep the Logo beginner content for days.

Two activities—Shoot and Quickdraw—have been especially designed for younger students. Shoot offers a game-like environment in which youngsters get practice estimating angles and distances, and Quickdraw lets students create and name designs by pressing single keys. These activities have been carefully structured to convey the idea of creating complex designs out of simple building blocks, one of the most important concepts in Logo programming. The procedures that underlie Shoot and Quickdraw are listed in the back of the book, and they are also available on a separate disk for those who want to avoid typing them in.

The second part of the book covers variables, the POLY procedure, and nongraphic activities with numbers, words, and lists. I appreciated the many clever cartoons that are used to reinforce the explanations of variables, conditionals, and recursion. Each cartoon embodies an important Logo programming concept, but they would have been even more effective if they had been accompanied by some commentary.

Too often, Logo is thought of as only a graphics language. Watt dispels this notion in Chapter 9, though, as he presents Logo commands for working with text and processing lists. This chapter is an excellent introduction to word and list manipulation for anyone who has worked with turtle graphics but is not quite up to tackling more advanced treatments of list processing (such as that found in Harold Abelson's *Logo for the Apple II*, reviewed in July 1983, page 238).

The third section of *Learning With Logo* complements and expands upon earlier chapters. The reader who has come this far is now ready to look inside Shoot, Quickdraw, and other tools that were presented as predesigned procedures earlier in the book. Watt reveals the inner workings of these programs so the reader can customize and enhance them. The theme of this last section is interaction—writing procedures that allow for user input. A poetry-generating program leads into an exploration of how computers can manipulate human language, and a game called Racetrack introduces animation.

When *Learning With Logo* first arrived at my bookstore, I glanced through it and said, "This is what we've needed for a long time." It's a perfect book for both learners and teachers. Only those who are going into advanced list-processing work will find it less than satisfying.

Math Made Tangible

Subtitled "An Invitation to the Art and Pattern of Nature," David Thornburg's *Discovering Apple Logo* is another wonderful book, but in a different vein. The book is restricted to Logo graphics, but it is just as much a book on mathematics. You'll find all of the topics you'd expect in an introductory Logo volume, but woven into the presentation of these are numerous revelations

about the world of math. As you learn about drawing, procedures, variables, and recursion, you're also finding out about static and dynamic symmetry, state-change invariants, tessellation, prime numbers, the golden mean, fractals, and dimensionality.

I found the last four chapters, in which Thornburg invites us to explore such mathematical concepts, to be the most interesting. I had, for example, encountered the idea of the golden mean as a student—it was one of those things you memorized for a test or trivia contest. But with Thornburg as guide, I explored the idea by building aesthetically pleasing boxes and spirals, and suddenly the concept came to life.

Fractals are another concept I had heard about, but it was not until Thornburg led me through the theory with a series of increasingly complex graphic images that it began to make any real sense. I was even able to appreciate that carried to the extreme, lines made up of fractals could generate an infinite perimeter that would enclose a finite area. I had once picked up a book on this subject because the idea intrigued me, but I didn't read more than a page before being turned off by the tone of mathematical formalism. But now, thanks to Thornburg's readily accessible presentation, I am intrigued again and can explore an idea I had once dismissed as too intimidating.

I could go on and on about the novel ways Thornburg enlivens the world of mathematics—how about a figure in 1.26 dimensions, for example?—but I'll leave some of the excitement for you to discover. As for the style of the book, you should understand that Thornburg is writing for adults. My only criticism of the author's Logo programming techniques is his overuse of the construction MAKE "SIZE :SIZE + 1. Consider these two alternatives:

```
TO GROWSTAR :SIZE :LIMIT
PENDOWN STAR :SIZE
IF :SIZE > :LIMIT [STOP]
WAIT 30
PENERASE STAR :SIZE
MAKE "SIZE :SIZE + 1
GROWSTAR :SIZE :LIMIT
END

TO GROWSTAR :SIZE :LIMIT
PENDOWN STAR :SIZE
IF :SIZE > :LIMIT [STOP]
WAIT 30
PENERASE STAR :SIZE
GROWSTAR :SIZE + 1 :LIMIT
END
```

The first procedure is typical of the way Thornburg uses the MAKE command. I object because it leads students to create far more global variables than are necessary, and these hang around and unexpectedly interfere with other procedures that use the same variable names. I cannot understand why Thornburg does not opt for the neater local variable as in the second procedure.

But this is a small criticism of a special book. David Thornburg uses Logo in a striking way to reveal the mathematical pattern and beauty of the world we live in.

Designed for Kids

Donna Bearden's *1, 2, 3 My Computer & Me* will appeal to students and classroom teachers—and for good reason. Each page is pleasing to the eye, with large type and many illustrations. The writing style is simple and enticing; indeed, I would not hesitate to pair up third-grade students and give each group a copy of the book as a text. However, junior high or high school students might be put off by the elementary tone of Bearden's presentation, even though the content would still be appropriate.

Each chapter in the book presents a single Logo concept, provides some guided practice, and then invites students to try open-ended explorations. The book does not go beyond the graphics applications of Logo, but within that scope the material is presented well. Beardon begins with simple drawing, creating procedures, and building with subprocedures before moving on to editing, saving and retrieving work.

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She then introduces recursion and conditionals, the use of the color commands, and the Cartesian coordinate commands. While certainly less comprehensive than Watt's *Learning With Logo*, this book should nonetheless find a happy audience among elementary school teachers of Logo.

The only criticism I have of the book's content lies in its explanation of recursion, for I think that it creates a misleading model of this powerful feature of Logo. When Bearden says that a recursive step in a procedure directs the program to "go back to the top line," she conveys the notion that part of the program recycles or loops. While this idea is fine for simple programs, it will create some basic confusion when the student encounters procedures that use embedded recursion.

I also object to the fact that the book tries to accommodate four different versions of Logo, but I'd place the blame more on Logo marketers than on the author. The differences between the versions make for confusion in the book, and even though Bearden does her best, it's a futile effort—there are now more than the four versions she includes. If the book is reprinted, which it is certainly worthy of, I hope that it is done in different editions for the different versions of the language. The fact that the developers of the various versions made them different for essentially mercenary reasons is the real discouragement here.

Like Watt, Bearden does an excellent job of balancing conflicting demands for Logo books. Teachers want what is basically a Logo curriculum, but the underlying concept of the language as an educational tool resists such a structured format. Logo learners and users, on the other hand, deserve a guide that opens up the free-form explorations that the language was designed to foster. To my mind, *1, 2, 3 My Computer & Me* succeeds in giving teachers something they will be comfortable with while encouraging students to explore and play in a mathematically rich world.

Limited Appeal

Gary Bitter and Nancy Watson's *Apple Logo Primer* is not as exciting as *Learning With Logo* or *Discovering Apple Logo*, but it is still a valuable item in a Logo library and has special appeal for a specific audience. To be more precise, this would be a fine book for use as a reference in a short, hands-on training session designed to familiarize teachers with Logo.

The first half of *Apple Logo Primer* provides an adequate tutorial in getting started with the version of Logo distributed by Apple Computer Inc. This section of the book covers the usual material, such as turtle graphics, file handling, animation, and combining text and graphics, although it does so without any notable flair.

What is unique about the book, though, is the next section, a 24-page unit called "Quick-Start Logo." While it does not go beyond the material presented earlier, it condenses the basics into a tidy review that would be especially helpful as a refresher course. Those of you for whom learning is remembering the stuff you forgot since the last time you used Logo will find this presentation an ideal reminder. The section is sprinkled with just enough practice exercises to reinforce the concepts it covers.

In the final section of the book, Bitter and Watson delve into the history of Logo, emphasizing the philosophy behind its design as an educational tool. Because these ideas are important to anyone who intends to teach Logo, their treatment here adds to the value of *Apple Logo Primer* as a text for training teachers.

Room for Choice

As I suggested at the outset, the books reviewed here in many ways represent the cream of the crop. None of them will steer you wrong, and each offers its own advantages. Dan Watt's *Learning With Logo* excels in terms of its careful organization and usefulness for learners of all ages, and its Helper's Hints make it a teacher's dream. David Thornburg uses Logo to take us into the far reaches of mathematics, but his *Discovering Apple Logo* is not accessible to younger students. Donna Bearden's *1, 2, 3 My Computer & Me* is just the ticket for elementary school students in that it gradually opens the world of Logo in an easy-to-follow way. And finally, *Apple Logo Primer*, although somewhat limited, does offer a quick course and some essential background information. All in all, it's a buyer's market when it comes to books about Logo. □

MICRO REVIEWS

by Mike Nicita and Ron Petrusha

Introducing the Apple IIc

by Philip Lieberman
Howard W. Sams, Indianapolis, 1984, 224 pages, paper $17.95

With its airy style and broad overview, this is the ideal beginner's introduction to a "useful little machine." The author discusses all the subjects found in every other IIc introduction: set-up considerations, hardware options, applications software, programming, and the IIc operating system. What differentiates Lieberman's text is his consistency in treating each topic simply but with adequate specifics, and his coverage of the widest possible range of introductory material. For example, though it provides a less detailed description of ProDOS and DOS 3.3 than the *Apple IIc User's Guide*, this is one of the few introductory guides for any microcomputer that includes programming surveys of BASIC, Logo, and Pascal. Likewise, the chapters on specific educational and business software packages convey the flavor of a wide range of vastly different applications programs. Lieberman has done an outstanding job of writing a solid operational and programming introduction for the IIc

novice. It is a text as useful and accessible as the machine it describes.

Programming the IBM PC & XT: A Guide to Languages

by Clarence B. Germain
Brady, Bowie, MD, 1984, 337 pages, paper $19.95

In an attempt to "instruct novice PC users to operate and to program their computer," Germain has assembled a guide to DOS, four high-level languages (BASIC, FORTRAN, COBOL, and Pascal), and 8086/8088 machine and assembly language. This broad coverage only arouses the suspicions of the supposed novice, who will find that the book amounts to nothing more than a reference work for each of the languages it surveys. While a few problem sets have been scattered throughout the text, these are surprisingly difficult and do little to develop the reader's proficiency in using any of the languages covered. Even as a stand-alone reference manual, *Programming the IBM PC & XT* suffers from a dense text and a lack of clear organization and topic development. This is a work that we recommend exclusively to the computer linguist who wants to develop a superficial familiarity with as many languages as possible, for it does little to teach the finer points of programming.

Introducing the Macintosh

by Charles B. Duff
McGraw-Hill, New York, 1984, 196 pages, paper $14.95

Admitting that the Mac's own accessibility "obviates the need for a host of 'how-to' books," Duff has instead crafted an introduction that provides what he calls "the larger view." Though complete computer novices may be a bit baffled by its nonchalant use of technical jargon, Duff's book does provide one of the best introductions to Macintosh features and capabilities. Duff's "larger view" remains unclouded by subjective hype: he critically notes weaknesses as well as strengths. Macintosh hardware and software are covered with special emphasis on applications and programming. Typical of Duff's thorough job is a section entitled "A Brief History of Desktop Computing" that traces the evolution of the Mac's state-of-the-art operating system. Eye-catching graphics, many generated by Bill Atkinson's now famous MacPaint graphics program for the Mac, supplement each discussion. For the experienced micro user considering the purchase of a Macintosh, this is the perfect introduction.

The Complete Software Marketplace 1984-85

by Roger Hoffman
Warner, New York, 1984, 236 pages, paper $17.95

Unlike the offerings of other current guides for software authors, the appeal of Hoffman's book is not a function of the comprehensiveness or detail of its directory of software publishers. Rather, it is the author's thorough attention to the nuances of every other aspect of software publishing that sets the book apart. Case studies, including the author's own software publishing experiences, present some of the many paths and pitfalls that await the aspiring software star. Here, as in the rest of the narrative section of the book, the full gamut of author involvement—from simple distribution arrangements to the formation of one's own software company—is covered. Hoffman's inside knowledge of subjects like royalty negotiations gives the book a unique candor. And while the book's listing of software publishers lacks the consistent structure and detail of other directories, it is one of the few sources of names, addresses, and telephone numbers of specialized agents, advertising agencies, attorneys, trade associations, regional software sales representatives, and products that in some way assist potential authors. While it may not provide "everything you need to know to design, market, and sell your own software," Hoffman's book is probably the best place to pick up the requisite business savvy.

Professional's Guide to the TI Professional Computer

by Alvin D. Schneider and Charles P. Nelson
Howard W. Sams, Indianapolis, 1984, 416 pages, paper $18.95

Despite its frequent idealization of the TI Professional's "unique" features, this businessperson's introduction is long on generalities and short on machine-specific details. The first two sections of the book, in fact, are devoted to the rudiments of computer literacy and to a machine-specific guide to computer selection. Once past initial system installation, the authors include a superficial survey of the three major operating systems available for the TI Professional and again turn to generalities in a section called "Data Processing Concepts and Procedures." In discussing themes such as interactive and batch processing, this treatment does provide a good introduction to computer operations for the complete novice. A final section outlines the considerations in choosing software for a business environment rather well but then uncritically lists a myriad of software packages for specialized business applications. Inconsistencies like these mean that anyone more sophisticated than the intimidated novice will prefer a work with far more substance than Schneider and Nelson offer.

1-2-3: Tips, Tricks, and Traps

by Dick Anderson and Douglas Ford Cobb
Que Corporation, Indianapolis, 1984, 257 pages, paper $14.95

Que's best-selling *Using 1-2-3* provided a systematic and careful overview of the integrated spreadsheet's major features. In *1-2-3: Tips, Tricks, and Traps*, authors Anderson and

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Cobb fill in the finer points. They cover a full range of topics, from worksheet layout and documentation to graphics, database management, and keyboard macros, along with such bonuses as memory management and sharing data with other programs. This is not, however, a book that is best read cover to cover; each chapter is divided into two- or three-paragraph sections focusing on single suggestions, techniques, or limitations. A clear, logical organization and thorough subject index circumvent the potential problem posed by this staccato presentation. For 1-2-3 users wondering just what went wrong with their spreadsheet as well as those concerned with broadening their repertoire of 1-2-3 techniques, *1-2-3: Tips, Tricks, and Traps* is a hands-on reference that will be used again and again.

Computing Together: A Parents' and Teachers' Guide for Using Computers with Young Children

by Fred D'Ignazio
Compute!, Greensboro, NC, 1984, 312 pages, paper $12.95

For some time now, D'Ignazio has "lived with a wife, two children, 18 computers and seven robots." This collection of his *Compute!* articles from the last two years combines insights into the parent-child-computer dynamic with touching vignettes drawn for the D'Ignazios' "extended family" album. Almost every computer-related topic of interest to parents and teachers is discussed in a very personal, affable style. Though providing few actual programs, D'Ignazio's book is laced with specifics. We discover firsthand why "Bank Street Writer is the preferred word processor for 7-year-old girls," why "computer sexism" remains an unsolved problem for the preteen populace, and why computer camps are as much of an adventure for grandmothers as for grandchildren. D'Ignazio enjoys writing as much as he enjoys computers, and this rare combination of interests and talents makes for an anthology as pleasurable as it is informative.

The Book of Adventure Games

by Kim Schuette
Arrays Inc., Los Angeles, 1984, 341 pages, paper $19.95

While microcomputer adventure games have bred their own following of hard-core aficionados, many users simply "throw in the towel on the first game" because they find the game's interface to be a far more insurmountable challenge than the adventure itself. These frustrated players will appreciate Schuette's treatment of 77 of the best-known adventure games for its help in learning to play and enjoy them. In most cases, a brief description of the game leads into a complete map of its terrain and the objects found in each location. The author even provides solutions to particularly thorny situations for the vast majority of the adventures. Beyond providing this valuable assistance to the novice adventure game player, *The Book of Adventure Games* doubles as a work on software selection; the brief paragraph on each game's "playability" indicates its overall quality and delimits its audience.

The Visible Computer: 6502—Machine Language Teaching System for the Apple II

by Charles Anderson
Software Masters, Houston, TX, 1983, 141 pages, book/disk package $49.95

This is one of the most original and effective introductions to assembly-language programming currently in print. The author's approach is quite simple: a high-resolution graphics display of the internal registers of a 6502 microprocessor simulates the actual movement of data that results when individual assembly-language commands are executed. You can "see" hexadecimal addresses being

moved, instructions being loaded, and program data "flowing" into the appropriate registers. It is what a book/disk tutorial was meant to be—an integrated, multimedia presentation that conveys information, much of it conceptual, on an order of magnitude greater than any of its individual components. The first three chapters cover the traditional background material—number systems and memory configuration—in a light and conversational text. With the fourth chapter, the actual book/disk tutorial begins. Each 6502 instruction is demonstrated in a working program. Because much of the difficulty with learning machine language focuses on register manipulation, stepping through each instruction with a visual assist from monitor displays goes a long way toward establishing a solid conceptual foothold. Though many advanced subjects are intentionally omitted from its concise treatment, some of the nuances of assembly-language programming, like calls from BASIC programs and sorting techniques, are discussed. We highly recommend *The Visible Computer: 6502* to every Apple II or IIe BASIC programmer who has decided to try out for the majors. It is one of the best ways to make that sometimes difficult transition a painless one. (Commodore 64 owners will find the same clear presentation in *The Visible Computer: 6502—Machine Language Teaching System for the Commodore 64*, by Charles Anderson and Jim Blackshear, $39.95.)

Spreadsheet Dilemma

by Peter H. Mackie and Phyllis Mackie
Dilithium Press, Beaverton, OR, 1984, 234 pages, paper $9.95; book and disk $29.95

Spreadsheet Dilemma marks a departure in the literature on electronic spreadsheets. Though marketed in book form alone, it is also available with a disk containing sample templates for each of the five IBM PC programs it reviews: 1-2-3, Supercalc 3, Multiplan, MBA, and Visicalc. While the demonstration disk provides a flavor of each program, the text alone compares and contrasts the five programs well enough for even the novice to make an informed software selection. Rather than providing abstract definitions, the authors quickly move to sample applications and case histories that, though sometimes overly ambitious, illustrate how a spreadsheet is eminently practical and usable. From there, the Mackies develop their examples and conclude by discussing some of the more esoteric features (such as Lotus's keyboard macros or MBA's file-handling system) that may be important in purchasing a spreadsheet. Although *Spreadsheet Dilemma* tends to exaggerate the "dilemma," it does provide an informed, practical guide to selecting a speadsheet, especially for novices. □

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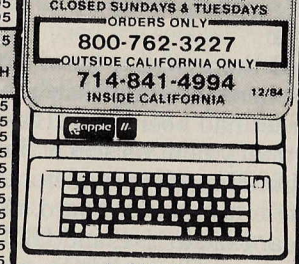

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wall, my fingers scrambling for holds. Even entering a line or two while accessing a database on Compuserve was a chore with this keyboard.

Another strike against the PCjr was the fact that the standard memory configuration on the IBM PC had gone up to 256K and was quickly rising beyond that. PCjr could muster only 128K, and a major selling point—the "take programs home from the office" factor—was virtually gone.

In any case, the computer-buying public wisely ignored the PCjr, despite dealer price cuts ("We've got to get rid of them somehow," a dealer told me last spring, explaining why he was giving printers away with discounted Juniors.) One mark of a good computer is the appearance of a piece of software specifically written for that machine that does something that, for a while at least, can only be done on that machine. Think of Visicalc for the Apple, Lotus's 1-2-3 for IBM, Musicalc for Commodore, MacPaint or Filevision for the Macintosh. It is damning to note that no such software emerged for the PCjr. Instead, a vicious downhill cycle began—as it became clear that not much of an installed base of PCjrs existed, or ever would, the software publishers who had been busily converting their products to Junior pulled back. Those who jumped in early, confident that any product backed by IBM would be a winner, got scalded. Ken Williams of Sierra On-Line released several games in specific PCjr formats, and in late spring, he told me he was taking a bath on all those games. "The machine is a turkey," he said.

This was IBM he was talking about. The company that was supposed to win the home market in a walk had fallen flat on its face.

Rebirth of the PCjr

Then it was August, and there was a "new" PCjr. Again, the rumors proved more exciting than the reality—the word on the street had been that IBM was going to come out with a totally new version of Junior with 256K minimum configuration, all for under a thousand bucks—with, of course, a new keyboard. As it turned out, the new keyboard did arrive, and IBM did right in promising a new replacement to all PCjr owners with the Chiclet model. (You get to keep the old one, and I expect it to be a terrific collector's item.) But the memory expansion would be partitioned in optional 128K increments—each 128K addition would cost around $300 in addition to the $999 retail one-drive computer. Another thing one might add to the computer was a $300 speech synthesizer with a vocabulary of 196 words on-board. IBM also announced some new PCjr software, including a Paint program, an Andrew Tobias Managing Your Money program, and a conversion of 1-2-3 especially for Junior.

I was very eager to get this stuff home. It amounted to no less than a personality change for the same PCjr who had been dealing with me like a recalcitrant third-grader. True to all the PCjr hardware documentation I had received so far, the manuals gave me simple instructions to hook on the memory attachment. IBM had toned down the cartoon characters on these new additions to the *Guide to Operations* (which soon was so stuffed with additions that the three-ring binder could not hold any more pages). But the most satisfying move was switching the keyboard from Chiclet to the new one. The size was virtually the same as the much despised predecessor (as it turns out, the same Idaho supplier made the new one), but the keys were real. It made a huge difference. Not that it was a particularly comfortable keyboard—while the keys were easier to hit, they still felt kind of squishy, and typing was more difficult than with the keyboards of the IBM PC, Macintosh, Apple IIe, Radio Shack Model 100, or even the Commodore 64. But even "barely acceptable" is a great improvement.

I was even beginning to think that at $1300 for a 256K machine, the PCjr might be a decent low-cost Wordstar or spreadsheet machine. Heck, at 512K, it might *cook*. I admit to feeling a little tingling down my spine when Don Estridge, the head Boca Raton-er, told us at the press conference that at $1300, the PCjr with a 128K memory attachment (for a total 256K) was "the best deal in town." Take that, Apple! And that warm feeling continued when I booted up the new Junior and saw the little diagnostic label that tells how much memory is active climb from 128K to 256K.

The high point of all this was when I got a copy of the new Colorpaint program, perhaps the best single PCjr-only program ever written. Once I got the Mouse Systems mouse ($150), used the $25 serial cord to plug it into the machine, and then plugged the mouse's power supply into the wall power outlet, I was ready to boot a DOS disk in the system, stick in the Colorpaint cartridge in one of the two cartridge slots, and type "g" at the A> prompt—a typically Byzantine process for starting a PCjr program. On-screen was a close cousin to Bill Atkinson's Macintosh MacPaint program, complete with pull-down menus; icons for spray paint, fill, erase, and text; options for brush stroke and circles. . .all kinds of things that MacPaint had, except the PCjr could do it in color! Now *this* is what I call computing! It was considerably slower than the Macintosh, and the Mouse Systems optical mouse is positively crippled compared to Mac's nimble pointer, but still, the program was elegantly done, and its crisp resolution and color showed the PCjr's graphic skills to full benefit.

DOS Dilemmas

But that turned out to be the exception. Because as I delved into the new pile of equipment from IBM, it became clear that this stuff was not meant to exploit Junior's strength—sound and graphics—but to make Junior a mightier business machine. It turns out, though, that making PCjr go that extra mile takes a considerable toll on a computer that was originally called "the easy one for everyone."

Let's start with MS-DOS 2.1. As operating systems go, it is not the friendliest for a consumer-oriented computer. On a one-drive system like the PCjr, it can be deadly. Copying disks, for instance, is a process that can

I wind up with a disk in my right hand and one in my left, looking hopelessly from one to the other and wondering which is the "Drive A" disk.

range from annoying to downright treacherous. On the Macintosh operating system or even a relatively dense system like CP/M, the system shows concern when a "destination disk" (that will receive the contents of a disk the user wants backed up) has information already on it—information that will be permanently lost if the disk-copy proceeds. Those systems warn the user and give him or her a chance to take the disk out before it's too late. The PCjr's operating system doesn't much care. Also, the on-screen prompts during the copying process are rather confusing—DOS 2.1 refers to disks as being from "Drive A:" or "Drive B:" when it is as clear as day that there is only one disk drive! So it is all too possible to lose valuable data. Even the cheerleading PCjr-dedicated magazines have noticed this fault, most amusingly when a reviewer of Homeword got so confused at the process that he erased the contents of his only program disk. I can sympathize—more than once, my attention has flagged during the eight or nine required swaps, and I wind up with a disk in my right hand and one in my left. I look hopelessly at one, then the other, trying to figure out which is the "Drive A:" disk, and which is "Drive B:" (as we shall see, the worry is compounded when we get to Drive C:).

You also have to worry whether a given application requires an 80-column display. Some applications, like Personal Communications Manager, allow you to patch the 80-column mode onto it. But with most applications, 80 columns is accessible only from DOS. So you wind up booting Wordstar and finding a 40-column display—with the normal command menu on top, which allows you perhaps room for one sentence on-screen at a time.

Then there is the annoying requirement in some cases of having to boot a DOS disk in order to run a program. Few programs allow you to copy DOS onto the disk itself—unfriendly, in any case, and unheard of in the Apple, Atari, and Commodore worlds, but downright hostile when one is immersed in the murky world of PCjr memory enhancement. In order to use the full 256K (or more), you must make up a different DOS disk. This is done by first backing up the old DOS disk, then using a supplied "Memory Options" disk to create a "DOS with memory enhancement" disk. Some applications allow you to copy this second version of DOS onto the application itself. Some don't. You must keep track.

Confusing? Well, in order to use the "RAM disk" capability of Junior, you have to prepare a *third* version of DOS. Again, on only some applications can you create an auto-boot disk with this application. Like all RAM disk schemes, of course, the information held in this imaginary "Drive C:" (which emulates a disk drive by apportioning part of the computer memory) is totally gone when the power is turned off or the machine is reset. Not ideal for a computer used at home.

It was also clear that making the PCjr do heavy-duty tasks required some kluge-work in the hardware, too. Once you add more than one plug-in "enhancement" to the side of Junior, you have to add a $150 power-supply module. The size of this module is no larger than the others—about an inch thick, adding not much bulk to the unit—though once you have four or five of those mothers attached, the center of gravity gets seriously skewed. However, the power attachment is hooked to a leaden, brick-like transformer like the one on the regular power cord. It also requires a power outlet. So if you have a 512K PCjr, you will have four modules daisy-chained to your machine. (IBM does not recommend adding any more than four attachments: you can add, say, a parallel printer attachment only at your own risk.) When you use the mouse, your Junior will need no less than *four* power outlets—one for the system unit, one for the extra power supplied, one for the mouse, and one for the monitor. (Add another if you use a printer.) Can you imagine *carrying* that octopus anywhere? Compare this to the Macintosh, a one-piece unit with a handle that requires one power cord for everything mentioned above.

Writing With Wordstar

My original goal was to write this very review on Wordstar on the PCjr. Everything initially went all right when I used the second version of DOS—which took advantage of the 256K I had on-board but did not use the RAM disk. Oh, there were some problems. Wordstar on PCjr is not exactly a dream. For one thing, the program did not seem suited to the workings of Junior, in ways I suspect that users of IBM-PC software will find true of other programs run on PCjr. For instance, Wordstar has many one-key commands like hitting the "d" key to open a document. This can also be done by hitting a single function key. But hitting a function key on Junior is a two-stroke operation. What is the purpose of a function key when it's twice as difficult to use as the standard way of doing things?

Then I tried to use Wordstar in RAM-disk mode. Even after I followed the instructions carefully, I could not get anything logged into the RAM disk while using my third version of DOS. When I did, I would type one character into a file, and the program would hang, not moving until I reset it. I wound up writing this review on my Macintosh.

Phantom Drive C

Eventually I talked to some friendly representatives of IBM and got the RAM disk working properly. It turned out that I had been confused between the

sketchy Micropro prerelease documentation on using the RAM disk and IBM's cryptic documentation, which—true to its Gerald McBoing-Boing spirit—was clear on installation processes but was absolutely Panglossian on its optimism that things would go right on the first try. Therefore I was helpless when things didn't go right.

I gladly admit that the RAM disk application gives PCjr considerably more muscle; my crowning achievement in this case was creating a Wordstar document in the phantom RAM disk named "Drive C" (don't ask me why a one-drive machine gets up to the third letter of the alphabet in naming its drives), getting out of Wordstar, running the communications program, and uploading my newly created document to an electronic service. The process went smoothly, and I recognized that Junior *can* be useful, if you bring him up properly. Of course, if at any point in the process I had done something stupid, like trip on one of the power cords or put a cartridge into the slot, the information in that document would have been gone.

The RAM disk can also be flummoxed by copy-protection programs, which can't be stored in "Drive C:" All of this underlines the hit-and-miss characteristics of a machine whose personality has been changed so drastically in the first year of life. Some things will work, some won't. It is up to the user to figure out which ones work. Since the big-memory PCjr is so new, publishers for the PC have yet to address the problems of PCjr owners who try to run their programs. And it is not at all clear that they will *ever* deal with those problems.

The point is this: a machine that was once packaged as a very-easy-to-use computer is now more powerful, but at the cost of becoming perhaps the most complicated consumer-oriented computer on the market today. While other manufacturers are concentrating on simpler user interfaces, IBM has in this case decided it is more effective to heatedly whisper in our ears that we can now run 1-2-3 on a $1000 machine. The people at the July 31 press conference, dazzled by the promises, asked Don Estridge if he weren't worried that the low pricing of the PCjr wouldn't affect sales of the IBM PC. Estridge said, in effect, Let it happen! We want computing power to the people! But the raw economics of it are quite different. You can now buy a 256K two-drive IBM PC for as little as $2000 (or a Compaq portable with two drives, a monitor, and graphics for $2200), less than $1000 more than a PCjr with memory enhancement that brings the machine to 256K. That extra cost is the difference between the constant inconvenience of a one-drive system with three different DOS disks, and a full-keyboard, fully expandable, one-power-cord machine that is the standard computer in the corporate world today.

It is very hard to believe that any person whose finances are sophisticated enough to require 1-2-3 cannot scrape up $700 or $900 to make the difference between a kluge and a relatively elegant computer. I think that IBM has very little to worry about when it comes to sales of the "new" PCjr cannibalizing PC sales.

The Smell of Death

Now it is time for the *why* of it all. For the first few months of the PCjr debacle, some journalists kept trying to get officials from IBM to admit what to some seemed obvious—the designers of the machine deliberately crippled Junior to keep prospective buyers of the higher-priced PC from buying bargain-priced Junior. Thus the Chiclet keyboard, the single disk drive, the apparent memory limitation. But anyone who spent time with the original PCjr could see that any such admission, even if some IBM employee were dumb enough to voice it, was irrelevant. The packaging of the machine, from the Chaplin-with-baby-carriage advertising to the Dick-and-Jane tone of the instructional disk, said it clearly: this is a machine for the home, for all those home computer tasks which some people say are possible. Judging from the cynical collection of software IBM originally packaged with Junior—a selection devoid of innovation—it seemed that IBM didn't really believe that a computer could be useful in the home at all. But since Apple was doing well, and people were buying Commodores, IBM perhaps figured that some of those same people might well be swayed into buying a home machine with those magic initials that already had won the personal computer field in the business market.

When everything backfired, and few wound up buying PCjrs, IBM turned its back on the mainly-for-home theory and tried to muscle it up. But since the machine was specifically designed as a simple home computer, the result was like putting a 428 Mopar engine in a Honda Civic: the car's interior was still tiny, and you constantly had to replace the brakes, but you could go fast. I suspect that memory-hungry computer buffs will react to the PCjr in the same way that speed freaks would react to the Honda Civic kluge: with disdain.

Imagine a scene that is entirely possible with the new, schizophrenic PCjr: your typical pinstriped suited entrepreneur is showing off his spreadsheet to the venture capitalist. He turns the machine on before he puts the disk in, and the PCjr responds as usual, bringing up the useless Cassette BASIC. Embarrassed, the entrepreneur reaches over to grab the disk, but his elbow presses the Escape key on the corner of the lightweight keyboard. This brings up Keyboard Adventure, with the cartoon character "PC" dropping down the right side of the screen with a blissful smile on his face. You think this guy will get his venture capital?

I think a lot about Keyboard Adventure when I roll the 256K PCjr through its paces. I also think a lot about not having a second disk drive, and having all those versions of DOS 2.1. Finally, I think about the lesson we have all learned from this: IBM is not infallible. It makes mistakes. Fortunately, not many will make the mistake of buying the PCjr, unless the rumors are true that IBM plans to cut the price hundreds of dollars more and sell it through K-Mart. Though its maker seems dedicated to supporting it, the machine has the smell of death about it. Long live its descendants, which undoubtedly will benefit from the hard-earned lessons IBM has learned from the sad, sad PCjr. □

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one does and what the other does." Mark Lepper, a Stanford professor of psychology, disagrees. "The same basic argument was made about *Sesame Street*," he says. "That show is very high in technical devices, and kids attend to it a lot."

Certain parents worry that video war games—where the child battles a descending mob from space or even, as in M.A.C.H. 3, enters a fighter plane and strafes realistic-looking terrain—may raise the tolerance for combative behavior. This debate pits the catharsis theory against the reinforcement theory. The catharsis model holds that such games induce children to purge their feelings of violence at the machines, so they are less likely to act aggressively in real life. The reinforcement model maintains that the games teach children that society deems violence a reasonable way to resolve disputes. "It's at least plausible that we ought to attempt to care about the time children spend at these games," Lepper says. "If the computer gets them more involved than television, the effects may be worse."

The effects on children are not all hazardous, of course. The computer gives them good times, valuable knowledge, and a sense of power. "There are very few things that society values at which kids are better than adults," says Lepper. "And there's an interesting way in which kids now have more expertise in computers than most parents. It's a very empowering experience for kids. The last time there was that reversal was with the children of first-generation immigrants, who tended to pick up the language and customs faster."

Social scientists should clearly investigate the impact of computers on children before the machines become too common. "We have a golden opportunity," says Lepper. Scientists did not begin studying the consequences of television until it was almost ubiquitous. Consequently, some trekked to the Yukon in search of towns with no TV, and conclusions about it are still somewhat tentative. Several computer studies are in fact now underway. While obvious effects on social interaction, as with team sports, should show up after a few years, others may not become apparent until high school, as did effects of the Headstart program.

Computers and Consciousness

The effects of the personal computer on adults seem both profound and somewhat elusive. Basically, the device seems to be altering our approach to writing and our concepts of ourselves and our mental processes.

Word processing has changed the way we think when writing. Henry Levin says it is not only causing people "to write letters again," but it is also helping them improve their letters because they are less afraid, more willing to take risks, and more critical of their writing. The computer has certainly made most people feel happier about their prose. It lets a writer jump back and forth among sentences, changing a line here or a phrase there. Word processing also, oddly, may demand more discipline of serious authors, since it eliminates the necessity to retype passages that are already good and thus the occasion to make them even better.

A deeper question involves the influence of the personal computer on our notions of the mind. Sherry Turkle, an MIT sociologist-psychologist and author of *The Second Self* (Simon and Schuster, 1984), says that micros provoke us almost despite ourselves to consider whether we think like them. For instance, they lend themselves well to metaphors for our own cognition, which of course imply mechanistic assumptions about the mind. The mechanistic, in turn, is process rather than drive or motive. It tells us how, not why. Such metaphors may affect the depth with which we view ourselves. If we term a certain kind of oral error a "Freudian slip," for instance, we suggest that we can learn something about our underlying nature by examining it. If, on the other hand, we refer to it as a mistake in information processing, we suggest that it is merely procedural. The level of inquiry becomes superficial.

Exposure to computers tends to create a certain paradoxical effect, says Turkle, and not just one bandied about among experts. Computer users can come to attribute more and more of their inner workings to program-like functions. Simultaneously, they may "isolate some sphere within themselves as the specifically noncomputational," she says. "And they come to value that highly. The end is a deeper focus on the emotional parts of the self." But this dichotomy engenders a fundamental tension. It wedges reason and emotion apart. Reason appears to be appropriately described by the computer metaphor while feeling does not. Turkle says, "This thinking leads to greater separation of the self."

But the device calls forth not only caution, but hope and optimism. "I think one of the most exciting things about it is the way people involve themselves in it with different styles," Turkle says. "For instance, visual people do things with it that they can see. The whole range amazes me." She also suggests that the personal computer offers a chance to bridge the gulf between the sciences and humanities that C. P. Snow identified in his famous essay *The Two Cultures and the Scientific Revolution*. "Literary people are interacting with technology for the first time," she says. "Kids who have programming skills can use them to create something beautiful. The fact that this is a medium that reaches out to both sides is very exciting." Finally, the stimulation of questions about the relation of mind and machine is salutary as well. "It's bringing philosophy into everyday life," she says. "Kids are talking about it. It's a very exciting cultural phenomenon."

As is the personal computer itself. Social change is the hallmark of the major technological innovation, for an invention that alters little improves little. The micro is creating social change. It is reshaping our jobs, schools, homes, language, and even our mental frameworks. It is streamlining and enriching our lives. Yet in our complex society, where cause and effect may be separated by chasms of space and time, where a single device can have both welcome and worrisome impacts at once, it behooves us not to ignore the totality of the kaleidoscopic wonder on our desks. □

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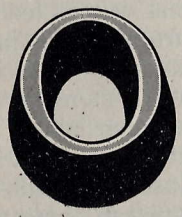
want or need to share it with anyone. SRI's McVeigh explains, "Once the development of local networks really starts going and with the development of disk technology even greater than we see today, then the personal user of a micro really won't have that much need for a central file server. He'll have more storage than he can possibly use. And if he wants to use a corporate database for some reason or another, he can go through a local network to get it. That will work against the development of systems with dumb terminals."



ONCE YOU HAVE a minicomputer on your desk at home, what do you do with it—write letters and keep budgets?

Because of this, the future microcomputer can be expected to chip away more and more at the domain of the corporate mainframe, McVeigh says. "The mainframe will become a great collector of databases for the corporation, and perhaps a traffic cop, and that's about it. A lot of the processing will migrate to where it ought to be."

With increasing control and power at their fingertips, micro users in the business world will become extremely demanding of their machines, according to Paul Wells, computer architecture specialist at Intel Corp. The user will want quick response from the system. "He will ask it to do six times more than it can do today," says Wells. "He won't want to be fooling around in an operating system." Software designers, experts agree, will be pushed hard to come up with the innovative software that the hardware demands.

Many Micros in the Home

For the home micro of the future, the crucial issues are not power and speed but cost and applications. Even at $5000, the supermicros will cost too much for the home. And the bigger question is, once you have a minicomputer on your desk at home, what do you use it for? Writing letters and keeping a budget? "It's a rare bird that forks out $6000 or $8000 for a home toy—you'd have to be weird," says Intel's Wells. "To my way of thinking, the critical factor for the personal computer to take off is overall low cost, under $1000 . . .and it's got to do more than lift your garage door."

Some experts predict that instead of producing only general-purpose microcomputers, the personal computer industry will fragment and begin making smaller, more specialized computers of all sorts—more game machines, graphics computers, portable terminals—while applying heavy-duty power to tasks like running interactive encyclopedias and educational software.

Game designer Eugene Jarvis agrees with the trend toward more special-purpose machines. "The processor is so cheap. In the IBM PC the processor and the memory is under $100," Jarvis says. "You pay $2000 and you get a big piece of lead and floppy-disk drives and other nonsense. The old myth of having one computer run your house is never going to happen. You're going to have a computer in every light bulb, each one figuring out how to save you a tenth of a cent. You might have an optical fiber network around your house that you can plug various intelligent units into. These peripherals will talk to each other."

But what will all these peripherals do? Wells thinks that to justify home computers, users will have to be able to tie into financial networks for banking at home, electronic funds transfer, and stock market transfer. Others cite the need for applications that lie beyond the realm of today's word-processing, spreadsheet, and game software. According to Roger Badertscher, president of Mindset Corporation, which makes a specialized graphics microcomputer, the problem the industry faces is how to bring in new classes of users and not just keep designing the next-generation product for the same group of users.

Two years ago a couple of researchers at SRI International addressed this question. They speculated on the software that might lend some home appeal to the 1990s micro and came up with a list published in 1982 by SRI International's Business Intelligence Program. The authors, Claudia Mazzetti and David L. Kolbus, wrote that although entertainment software currently dominates the home market, considerable activity is also underway to develop equipment and software to serve more utilitarian needs. Their forecast includes:

- expert "parenting" systems that monitor children's activities, warn of possible problems, and advise appropriate responses
- intelligent games that interact with several players and automatically adjust the parameters of play, introducing new contingencies based on levels of skill
- story generators and animation packages for creating personalized forms of entertainment and communications; such packages could provide, for instance, expertise in watercolor techniques or in dialogue construction for short stories or novels
- expert systems for diagnosing household problems and providing advice for do-it-yourself repairs
- intelligent control of appliances in response to oral directions
- advice on nutrition and preventive health care

•advice on tax computation, financial planning, budgeting, and legal questions
•better systems to aid in identifying, overcoming, or compensating for specific learning or physical disabilities
•expert "librarian" systems capable of helping develop strategies for information search and retrieval of data

Getting There from Here

These predictions for the supermicro of the 1990s are more than idle ravings or fanciful dreams. Broad advances along several technological fronts are making these prospects possible.

Chip density—the number of transistors on a chip—is increasing at a rate of 20 percent a year. The technology is developing so rapidly that most experts are afraid to predict anything further away than 1990. "Before then, we'll have a million bits on a chip," says MIT's Allen. "It is probably hard to think too big."

The growing ability to customize silicon chips for particular applications will add new dimensions to microcomputers, adds John Hennessy, director of Stanford University's computer systems laboratory. Hennessy expects custom silicon to bring high-resolution graphics and a limited amount of voice recognition within five or ten years. "You might still type text on a word processor but speak commands rather than type in the command codes," he says.

Memory is also declining in cost, reducing the overall expense of computers and aiding design innovations. The falling price of memory has let computer architects effect some radical new designs for microprocessors, increasing their speed and lowering their cost.

For example, the Reduced Instruction Set Computer (RISC) architecture of two powerful, new minicomputers—the Pyramid 90X and the Ridge 32s—may also find applications in microprocessor design. RISC reduces and simplifies the instruction set embedded in the microprocessor's controller and is faster and cheaper. At the University of California at Berkeley, for example, a team headed by Professor David Patterson managed to get most of Xerox's Smalltalk, a highly sophisticated programming system, on a single chip by using RISC technology.

With microprocessors becoming faster and faster, Hennessy says, the big challenge for designers of microcomputers is to speed up the rest of the machine to take advantage of them. "You can see (microprocesors) now as fast as the VAX is," says Stanford's Hennessy. "But you can't take that processor and put it on a board and stick it on an IBM PC or an Apple, simply because the rest of the hardware is not fast enough to support it."

More important than any single microprocessor technology is the declining cost of designing and manufacturing computers. This is leading to more experimentation, which in turn will produce interesting, unexpected results—and soon.

"I got a kick out of the old Star Trek computer," says Wells. "That's coming. We're damn near there." □

MY FIRST PERSONAL COMPUTER

JIM EDLIN

, designer of the Wordvision word-processing program, first stumbled across personal computers in 1976 at a store called Itty Bitty Machine Company.

There are several computers that I think of as my first. It all depends on what you mean by "first." And "my." My first first computer was a one-night stand. I'm a little embarrassed about it now, but to tell the truth it was a Radio Shack TRS-80.

In 1977, I was hired to produce what I think may have been the first television commercial ever to advertise personal computers. For one of the "stars" in my commercial I borrowed a just-introduced TRS-80 from Radio Shack headquarters. The afternoon before the commercial was to be shot, the big box from Texas arrived at my office. I cleared off my desk, opened the box, and set 'er up. That night, long after the cleaning crew had departed, I was still there, entranced in the glow of the screen.

I started the same way so many have done. I told it to PRINT "HELLO." And the screen helloed me back. I plunged on, trying the things I'd heard about. I was clumsy at first, but by the time the traffic below my office window had thinned to an occasional cab, I was even venturing into PEEKs and POKEs.

The next day, alas, was all business in front of the cameras. When the end of it came, the TRS-80 was packed in its box, sent away to wherever it was expected next, and my first first computer was out of my life.

My next computer encounter, a few weeks later, lasted the weekend. This time it was an Apple II loaned to me for a few days of promotional appearances in shopping malls. I never got the Apple to do anything much more interesting than play Breakout. When the Apple went away I didn't miss it. And to this day I remain cool to Apple computers.

Then there was the first computer that ever did real work for me. It was a Sol-20, a transitional computer between the blinking-light boxes of the original Altairs and IMSAIs and the later, typewriter-like Apples and Commodore PETs. The Sol belonged to David Bunnell, with whom I was writing a book proposal. David lent me the computer and by the time he repossessed it, I was hooked.

The first personal computer that captured my heart and soul was named Compucolor II. It was a contemporary of the Apple II and had everything I thought the Apple lacked—a wonderful keyboard, a dazzling screen, snazzy software. But the Compucolor was like the little girl who had the little curl: When it was good it was very very good. And when it was bad, which was often, it was horrid. Still, it was the first personal computer I got really intimate with—discovering all its features, and what made it tick.

The first computer I actually made it legal with is the Compaq on which I write these words. After seven years of laboring in the vineyards of personal computerdom, I finally wrote my own personal check for one. (This is where the definition of "my" comes in.) It has become an important partner in my life. I work with it. I communicate using it. On occasion I play with it. It often travels with me. It is a rare day when my hands do not touch its keyboard. It is also a rare day when I don't wish for far more from it than it is able to provide.

So I'm hoping there is at least one more "first" personal computer left for me: the first one to meet or exceed my fantasies of what a personal computer should be. □

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The Telephone Assistant

A sophisticated phone directory for finding hard-to-spell names in a hurry

by George Stewart

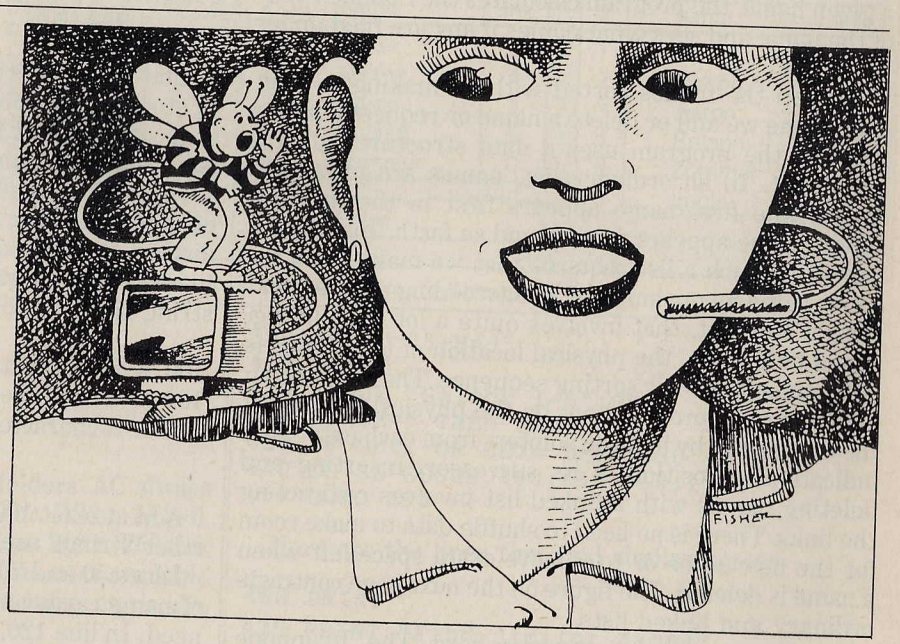


Illustration by Mark Fisher

Sometimes you're caught without a telephone directory and, even worse, don't know how to spell the last name of the person you want to call. Is it Archie Smith or Archie Smythe, Karl Buskosky or Karl Biaskowski?

This month we present The Telephone Assistant, a BASIC program that turns your computer into a miniature directory-assistance operator. The program lets you store and retrieve names and telephone numbers with your computer. But this program is different from run-of-the-mill computerized phone directories: it looks up and lists any entries that have the same or similar-sounding last names.

The Telephone Assistant is based on a little-known filing system called Soundex that helps telephone operators, airline reservationists, detectives, and researchers locate names when the exact spelling is not known. The program also has options for adding and deleting names and listing the entire directory by Soundex code. But the program won't altogether replace the friendly telephone operator: for one thing, your computer simply doesn't have enough memory to store an entire telephone directory.

How the Program Works

To set up a Soundex filing system, the program assigns each last name a code that is determined by the name's constituent letters. The coding method usually gives the same code to variant spellings of the same name and to similar-sounding names.

The coding procedure involves five steps. First, the program replaces every letter in the name with a number according to the following table:

Letter	Soundex Number
A,E,H,I,O,U,W,Y	0
B,F,P,V	1
C,G,J,K,Q,S,X,Z	2
D,T	3
L	4
M,N	5
R	6

Second, if the resulting code contains two or more identical digits in succession, the program deletes all but the first digit in the series. Third, it replaces the initial digit of the code with the first letter of the name. Fourth, it deletes all zeros. And finally, if the resultant code contains more than four characters, the program uses only the first four. If the code contains fewer than four characters, the program adds sufficient zeros to make up a four-character code. As an example, here are

George Stewart is a contributing editor of *Popular Computing*.

the five steps in the Soundex coding process for the name Allricht:

```
          ALLRICHT
Step 1:   0 4 4 6 0 2 0 3
Step 2:   0 4 6 0 2 0 3
Step 3:   A 4 6 0 2 0 3
Step 4:   A 4 6 2 3
Step 5:   A 4 6 2
```

After coding a name, the program files it in a "folder" according to its Soundex code and alphabetically on a "name card" within each code. For instance, Soundex S530 could contain Schmidt, Smith, and Smythe. After the program codes and files all the names, the Soundex system is ready for use. To find the variant spellings of a given name, the program calculates the Soundex code of the name and sees what names if any are filed under that code.

To keep the names sorted without making us wait every time we add or delete a name or request a phone number, the program uses a data structure called a linked list. In an ordinary list, names are physically sorted—the first name appears first in the list, the second name appears second, and so forth. Inserting a name into such a list requires that we make room for a new name by pushing all the succeeding names back. With a long list, that involves quite a lot of shuffling.

In a linked list, the physical location of the names is independent of their sorting sequence. The sequencing information is provided not by the physical location of the entries but by links or pointers from each entry that indicate the position of its successor. Inserting and deleting names with a linked list involves redirecting the links. There is no need to shuffle data to make room for the new name or to remove extra space left when a name is deleted. The figure on the next page contrasts ordinary and linked lists.

As we present the program here, The Telephone Assistant does not store the names on disk. If you run the program as is, you'll have to enter the entire directory each time. Adding disk-storage capabilities to the program isn't difficult. We simply don't have room in this article to present and explain the extra program lines. Furthermore, disk-storage techniques vary widely from one computer to another. At the end of this article, we list one version of a disk input and output routine as an example.

The BASIC Program

The Telephone Assistant is written in Microsoft BASIC and should run without any modification on most personal computers. Look up any unfamiliar BASIC words in your reference manual to find out if your computer uses that word or if it has another word for the same function.

We present the program in logical blocks. Type them in as you read along, and check your work before continuing to the next block.

The first block sets up several constants and creates the data structures for the linked lists:

```
10 PRINT
20 PRINT "Soundex Telephone Assistant"
30 PRINT
40 CLEAR 5000
50 INPUT "How many name cards are
     needed ";MN
60 IF MN<1 THEN 50
70 INPUT "How many Soundex folders are
     needed ";MC
80 IF MC<1 THEN 70
90 YES=1
100 NO=0
110 NU$="": REM No spaces between quotes
120 S$="01230120022455012623010202"
130 DIM CO$(MC), NR%(MC), CL%(MC),
     NA$(MN), NL%(MN), NF$(MN), PH$(MN)
```

Line 40 reserves 5000 bytes of string space in memory to store names, phone numbers, and codes. Most versions of Microsoft BASIC require this line. If you have Applesoft or Commodore BASIC, delete line 40.

The 5000 bytes cleared in line 40 should be more than enough for a directory of 100 names requiring up to 100 distinct Soundex codes. To figure out how much space to reserve for larger or smaller directories, calculate the string space as follows:

```
100 × 20 characters avg. name length = 2000 bytes
100 × 4 characters per code = 400 bytes
100 × 8 characters per phone number = 800 bytes
                total = 3200 bytes
```

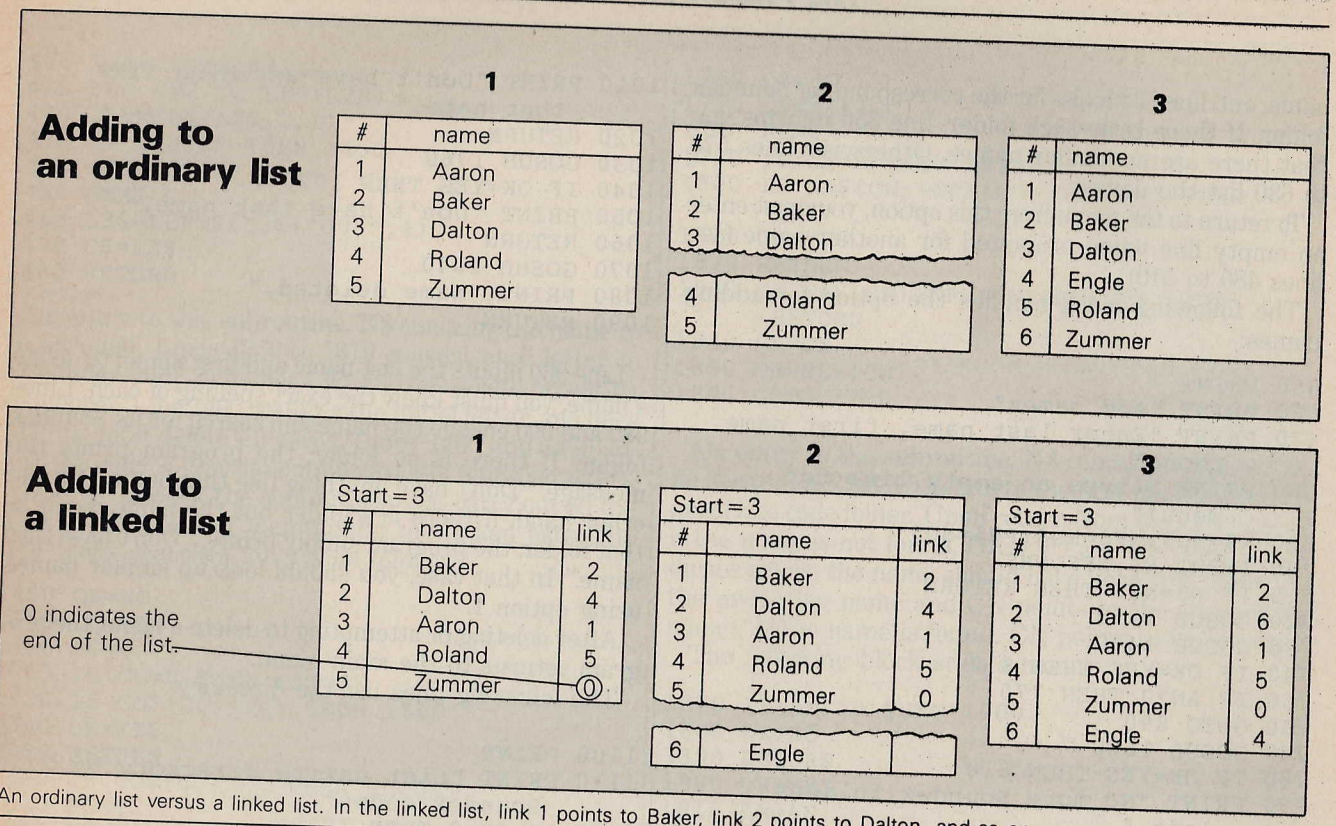
Add at least 1000 bytes to the total to accommodate other strings used in the program.

Lines 50 and 70 prompt you to estimate the number of name cards and Soundex folders (codes) that you'll need. In line 120, S$ contains the Soundex number replacement table for the letters A through Z. Type in all 26 digits carefully.

Line 130 sets up the arrays. The $ and % symbols indicate string and integer arrays, respectively. If your computer doesn't have integer arrays, omit the % signs throughout the program. If you use the % signs, be sure to use them throughout the program exactly as shown.

The following block of lines sets up two linked lists—one for names and one for Soundex codes.

```
140 PRINT
150 PRINT "Setting up the directory
      file. One moment..."
160 FOR AC=1 TO MC-1
170 CL%(AC)=AC+1
180 NEXT AC
190 CL%(MC)=0
200 AC=1
210 FOR AN=1 TO MN-1
220 NL%(AN)=AN+1
230 NEXT AN
```



An ordinary list versus a linked list. In the linked list, link 1 points to Baker, link 2 points to Dalton, and so on.

```
240 NL%(MN)=0
250 AN=1
260 KN=0
270 KC=0
280 SL=0
```

Lines 160 to 200 link the Soundex folders. AC always points to the next available code folder. When AC=0, no more code folders are available. Lines 210 to 250 link the name cards. AN always points to the next available name card. When AN=0, no more name cards are available.

KN and KC count the number of name cards and code folders in use. SL points to the first code folder. SL=0 indicates that the file is empty.

The next block presents a menu with options to find similar names, add names, delete names, list the entire directory, and end:

```
290 PRINT
300 PRINT "Directory contains ";KN;"
      names"
310 PRINT "in ";KC;" Soundex folders."
320 PRINT "There are ";MN-KN;" unused
      name cards"
330 PRINT "and ";MC-KC;" unused Soundex
      folders."
340 PRINT
350 PRINT "1-Find similar names"
360 PRINT "2-Add names"
370 PRINT "3-Delete names"
380 PRINT "4-List entire directory by
      Soundex codes"
390 PRINT "5-End"
400 PRINT
410 INPUT "Select 1-5";SE
420 IF SE=5 THEN END
430 IF SE<1 OR SE>4 THEN 350
440 ON SE GOSUB 460,650,910,1100
450 GOTO 290
```

Here are the lines that find similar names:

```
460 PRINT
470 PRINT "Find similar names"
480 PRINT "Enter last name (empty line
      for menu)"
490 N$=NU$
500 INPUT N$
510 IF N$=NU$ THEN RETURN
520 GOSUB 1250
530 GOSUB 1490
540 IF OK=YES THEN 570
550 PRINT "There is no Soundex folder
      for that name."
560 GOTO 480
570 PRINT "Under code ";C$;" are the
      following names:"
580 CN=NR%(CC)
590 IF CN=0 THEN 630
600 PRINT NA$(CN),NF$(CN),PH$(CN)
610 CN=NL%(CN)
620 GOTO 590
630 PRINT "End of list"
640 GOTO 480
```

Line 480 prompts you to enter one version of the last name. Line 520 calculates the Soundex code for the

name, and line 530 looks for the corresponding Soundex folder. If there is no such folder, line 550 informs you that there are no similar names. Otherwise, lines 570 to 630 list the names.

To return to the menu from this option, you must enter an empty line when prompted for another name (see lines 480 to 510).

The following block handles the option for adding names:

```
650 PRINT
660 PRINT "Add names"
670 PRINT "Enter last name, first name,
      phone"
680 PRINT "(type an empty line for
      menu)"
690 N$=NU$:NF$=NU$:PH$=NU$
700 INPUT N$,NF$,PH$
710 IF N$=NU$ THEN RETURN
720 GOSUB 1250
730 GOSUB 1490
740 IF OK=YES THEN 810
750 IF AN>0 THEN 770
760 GOTO 890
770 GOSUB 1600
780 IF OK=YES THEN 810
790 PRINT "No more Soundex folders
      left."
800 RETURN
810 GOSUB 1760
820 IF OK=YES THEN 870
830 GOSUB 1870
840 IF OK=NO THEN 890
850 PRINT "Name added. Enter next name:"
860 GOTO 680
870 PRINT"Name already exists. Enter
      next name:"
880 GOTO 680
890 PRINT "No more name cards left."
900 RETURN
```

Line 700 inputs the last name, first name, and telephone number. Line 720 calculates the Soundex code for the name, and line 730 searches for the corresponding folder. If there is no such folder, the program takes one from the list of unused folders.

Given a Soundex folder, line 810 checks to see whether that folder already contains the specified name. If it doesn't, line 830 adds the name. The program continues asking for another name until you enter an empty line.

The next block deletes names from the directory:

```
910 PRINT
920 PRINT "Delete a name"
930 PRINT "Enter last name, first name"
940 PRINT "(type an empty line for
      menu)"
950 N$=NU$
960 INPUT N$,NF$
970 IF N$=NU$ THEN RETURN
980 GOSUB 1250
990 GOSUB 1490
1000 IF OK=YES THEN 1030
1010 PRINT "Don't have anything like
       that name."
1020 RETURN
1030 GOSUB 1760
1040 IF OK=YES THEN 1070
1050 PRINT "Don't have that name."
1060 RETURN
1070 GOSUB 2040
1080 PRINT "Name deleted."
1090 RETURN
```

Line 960 inputs the last name and first name; to delete a name, you must know the exact spelling of each. Lines 980 and 990 encode the name and search for its Soundex folder. If there is no folder, the program prints the message, "Don't have anything like that name." On the other hand, if there is a folder but the name is not in that folder, the program simply prints, "Don't have that name." In that case, you should look up similar names using option 1.

After deleting or attempting to delete a name, the program returns to the main menu.

The following lines list the directory:

```
1100 PRINT
1110 PRINT "List entire directory by
       Soundex codes"
1120 IF SL=0 THEN 1230
1130 CC=SL
1140 PRINT CO$(CC)
1150 PRINT "----"
1160 CN=NR%(CC)
1170 PRINT NA$(CN),NF$(CN),PH$(CN)
1180 CN=NL%(CN)
1190 IF CN>0 THEN 1170
1200 PRINT
1210 CC=CL%(CC)
1220 IF CC>0 THEN 1140
1230 PRINT "End of list"
1240 RETURN
```

The program starts with the first Soundex folder (SL), prints its contents, and moves on to the next folder, indicated by the value of CL%( ). CL%( )=0 indicates the end of the list.

The next lines calculate the Soundex code for a last name:

```
1250 L1$=NU$
1260 FOR C=1 TO LEN(N$)
1270 C$=MID$(N$,C,1)
1280 SQ=ASC(C$)-ASC("A")+1
1290 IF SQ<1 OR SQ>26 THEN 1310
1300 L1$=L1$+MID$(S$,SQ,1)
1310 NEXT C
1320 L2$=LEFT$(L1$,1)
1330 LC$=L2$
1340 FOR C=2 TO LEN(L1$)
1350 C$=MID$(L1$,C,1)
1360 IF C$=LC$ THEN 1390
1370 L2$=L2$+C$
1380 LC$=C$
1390 NEXT C
```

```
1400 L3$=LEFT$(N$,1)
1410 FOR C=2 TO LEN(L2$)
1420 C$=MID$(L2$,C,1)
1430 IF C$="0" THEN 1450
1440 L3$=L3$+C$
1450 NEXT C
1460 L3$=LEFT$(L3$+"000",4)
1470 C$=L3$
1480 RETURN
```

On entry to this subroutine, N$ contains the name to be encoded. Lines 1250 to 1310 convert each letter to a Soundex digit, and lines 1320 to 1390 delete repeating sequences. Line 1400 restores the initial letter, and lines 1410 to 1450 delete all zeros. Lines 1460 and 1470 adjust the code so that it contains exactly four characters.

Now we present the subroutines that carry out all the nitty-gritty tasks of maintaining the linked lists. The first block searches for a code folder:

```
1490 OK=NO
1500 CC=SL
1510 PC=0
1520 IF CC=0 THEN RETURN
1530 IF CO$(CC)<>C$ THEN 1560
1540 OK=YES
1550 RETURN
1560 IF CO$(CC)>C$ THEN RETURN
1570 PC=CC
1580 CC=CL%(CC)
1590 GOTO 1520
```

On entry to the subroutine, C$ contains the code to be located. Upon return from the subroutine, if the code is not found, OK=NO and PC and CC indicate where the code should have been (PC points to the preceding folder and CC to the succeeding folder). If the code is found, OK=YES and CC points to its location.

The following block adds a code:

```
1600 IF AC<>0 THEN 1630
1610 OK=NO
1620 RETURN
1630 OK=YES
1640 SC=AC
1650 AC=CL%(AC)
1660 KC=KC+1
1670 CO$(SC)=C$
1680 CL%(SC)=CC
1690 NR%(SC)=0
1700 CC=SC
1710 IF PC<>0 THEN 1740
1720 SL=CC
1730 RETURN
1740 CL%(PC)=CC
1750 RETURN
```

Lines 1600 to 1660 locate the first unused code folder in CO$( ), pointed to by AC. Line 1670 assigns the code C$ to that folder. Lines 1680 to 1750 set up the links to the preceding and succeeding folders.

The next block searches for a name inside a code folder:

```
1760 OK=NO
1770 CN=NR%(CC)
1780 PN=0
1790 IF CN=0 THEN RETURN
1800 IF NA$(CN)+NF$(CN)<>N$+NF$ THEN
      1830
1810 OK=YES
1820 RETURN
1830 IF NA$(CN)+NF$(CN)>N$+NF$ THEN
      RETURN
1840 PN=CN
1850 CN=NL%(CN)
1860 GOTO 1790
```

On entry to the subroutine, N$ contains the name to be located. NR%(CC) points to the first name in the appropriate code folder. Upon return from the subroutine, if the name is not found, OK=NO and PN and CN indicate where the name should have been (PN points to the preceding name and CN points to the succeeding name). If the name is found, CN points to its location.

The following block adds a name:

```
1870 IF AN<>0 THEN 1900
1880 OK=NO
1890 RETURN
1900 OK=YES
1910 SN=AN
1920 AN=NL%(AN)
1930 KN=KN+1
1940 NA$(SN)=N$
1950 NF$(SN)=NF$
1960 PH$(SN)=PH$
1970 NL%(SN)=CN
1980 CN=SN
1990 IF PN<>0 THEN 2020
2000 NR%(CC)=CN
2010 RETURN
2020 NL%(PN)=CN
2030 RETURN
```

AN points to the first unused name card; if AN=0, no more cards are available. Lines 1910 and 1920 take a card from the list of unused cards. Lines 1940 to 1960 record the last name, first name, and phone number on the card. Lines 1970 to 2030 set up the links from the new name card to its predecessor and successor.

Finally, here's the subroutine that deletes a name:

```
2040 IF PN<>0 THEN 2070
2050 NR%(CC)=NL%(CN)
2060 GOTO 2080
2070 NL%(PN)=NL%(CN)
2080 NA$(CN)=NU$
2090 NF$(CN)=NU$
2100 PH$(CN)=NU$
2110 NL%(CN)=AN
2120 AN=CN
2130 KN=KN-1
2140 IF NR%(CC)<>0 THEN RETURN
2150 IF CC<>SL THEN 2180
2160 SL=CL%(CC)
2170 GOTO 2190
```

```
Soundex Telephone Assistant

How many name cards are needed ? 100
How many Soundex folders are needed ? 80

Setting up the directory file.
 One moment...

Directory contains  0  names
in  0  Soundex folders.
There are  100  unused name cards
and  80  unused Soundex folders.

1-Find similar names
2-Add names
3-Delete names
4-List entire directory by Soundex codes
5-End

Select 1-5? 2

Add names
Enter last name, first name, phone
(type an empty line for menu)
? SMITH,JOSH,224-2020
Name added. Enter next name:
(type an empty line for menu)
? SMYTHE,CHERYL,222-2212
Name added. Enter next name:
(type an empty line for menu)
? SIMPSON,JARROLD,924-3013
Name added. Enter next name:
(type an empty line for menu)
? SAMPSON,ALVIN,943-3213
Name added. Enter next name:
(type an empty line for menu)
? BROUN,H.R.,525-4033
Name added. Enter next name:
(type an empty line for menu)
? BRZINSKI,JOSEF,202 336-0000
Name added. Enter next name:
(type an empty line for menu)
?

Directory contains  6  names
in  4  Soundex folders.
There are  94  unused name cards
and  76  unused Soundex folders.

1-Find similar names
2-Add names
3-Delete names
4-List entire directory by Soundex codes
5-End

Select 1-5? 4

List entire directory by Soundex codes
B625
----
BRZINSKI        JOSEF        202 336-0000
B650
----
BROUN           H.R.         525-4033

S512
----
SAMPSON         ALVIN        943-3213
SIMPSON         JARROLD      924-3013

S530
----
SMITH           JOSH         224-2020
SMYTHE          CHERYL       222-2212

End of list

Directory contains  6  names
in  4  Soundex folders.
There are  94  unused name cards
and  76  unused Soundex folders.

1-Find similar names
2-Add names
3-Delete names
4-List entire directory by Soundex codes
5-End

Select 1-5? 1

Find similar names
Enter last name (empty line for menu)
? BROWN
Under code B650 are the following names:
BROUN           H.R.         525-4033
End of list
Enter last name (empty line for menu)
? SMITH
Under code S530 are the following names:
SMITH           JOSH         224-2020
SMYTHE          CHERYL       222-2212
End of list
Enter last name (empty line for menu)
? BREZHINSKY
Under code B625 are the following names:
BRZINSKI        JOSEF        202 336-0000
End of list
Enter last name (empty line for menu)
?

Directory contains  6  names
in  4  Soundex folders.
There are  94  unused name cards
and  76  unused Soundex folders.

1-Find similar names
2-Add names
3-Delete names
4-List entire directory by Soundex codes
5-End

Select 1-5? 5
```

This sample run of The Telephone Assistant shows the main menu and several options.

```
2180 CL%(PC)=CL%(CC)
2190 CO$(CC)=NU$
2200 CL%(CC)=AC
2210 AC=CC
2220 KC=KC-1
2230 RETURN
```

Testing and Using the Program

A sample run of the program appears at left. When typing in names, be sure to use capital letters only; the program does not encode lowercase letters. If your computer stops with an OS error (out of string space), increase the number of bytes reserved in line 40. If your computer stops with an OM error (out of memory), reduce the number of name cards, Soundex folders, and the amount of bytes cleared in line 40.

To make the program truly practical, you'll want to add two options to the menu: save names to disk and load names from disk. The changes to the menu are simple:

```
390 PRINT "5-Save names to disk"
392 PRINT "6-Load names from disk"
394 PRINT "7-End"
400 PRINT
410 INPUT "Select 1-7";SE
420 IF SE=7 THEN END
430 IF SE<1 OR SE>6 THEN 350
440 ON SE GOSUB 460, 650, 910, 1100,
      2240, 2430
```

Here are the disk input and output routines for Microsoft BASIC:

```
2240 IF KN>0 THEN 2270
2250 PRINT "The directory file is
      empty."
2260 RETURN
2270 PRINT "Save names to disk"
2280 PRINT "Name the output file (empty
      line for menu)"
2290 FO$=NU$
2300 LINE INPUT FO$
2310 IF FO$=NU$ THEN RETURN
2320 OPEN "O",1,FO$
2330 CC=SL
2340 CN=NR%(CC)
2350 PRINT #1, NA$(CN); ","; NF$(CN);
     ","; PH$(CN)
2360 CN=NL%(CN)
2370 IF CN>0 THEN 2350
2380 CC=CL%(CC)
2390 IF CC>0 THEN 2340
2400 PRINT "Directory saved in ";FO$
2410 CLOSE 1
2420 RETURN
2430 PRINT "Load names from disk"
2440 PRINT "Name the input file (empty
      line for menu)"
2450 FI$=NU$
2460 LINE INPUT FI$
2470 IF FI$=NU$ THEN RETURN
2480 OPEN "I",1,FI$
2490 PRINT "Reading the file..."
2500 IF EOF(1) THEN 2760
2510 INPUT #1,N$,NF$,PH$
2520 IF N$=NU$ THEN 2500
2530 PRINT N$;",";NF$;",";PH$;
2540 GOSUB 1250
2550 GOSUB 1490
2560 IF OK=YES THEN 2640
2570 IF AN>0 THEN 2590
2580 GOTO 2720
2590 GOSUB 1600
2600 IF OK=YES THEN 2640
2610 PRINT "--CANCEL: No more Soundex
      folders left."
2620 CLOSE 1
2630 RETURN
2640 GOSUB 1760
2650 IF OK=YES THEN 2700
2660 GOSUB 1870
2670 IF OK=NO THEN 2720
2680 PRINT "--OK"
2690 GOTO 2500
2700 PRINT "--CANCEL: Duplicate name."
2710 GOTO 2500
2720 PRINT "--CANCEL: No more name cards
      left."
2730 CLOSE 1
2740 RETURN
2750 PRINT
2760 PRINT "End of file ";FI$
2770 CLOSE 1
2780 RETURN
```

Applesoft and Commodore BASIC versions differ substantially. □

Author's Note: In the Concentration program (September 1984, page 200), add these lines:

```
662 IF CL>2 THEN 670
663 PRINT "Last 2 cards don't match.
      Game over."
664 GOTO 850
```

In the Roman Numerals program (October 1984, page 212), change line 250 to the following:

```
250 DATA M, CM, D, CD, C, XC, L, XL, X,
      IX, V, IV, I
```

Do you have questions about this program or suggestions for future projects? Send them to: George Stewart, The Program Factory, POB 137, Hancock, NH 03449. Enclose a self-addressed, stamped envelope if you want a reply. For programming questions, include a program listing, sample run, and brief description of your problem.

Editor's Note: George Stewart's book *The Apple Program Factory* (Osborne/McGraw-Hill, 1984, $11.95) is a collection of 20 programming projects, most of which have appeared in these pages. The programs have been revised and enhanced specifically for computers with Applesoft BASIC to make use of features like graphics, disk files, and sound. A Commodore 64 version of the book is also available.

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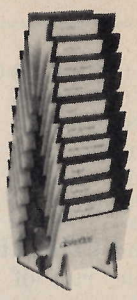

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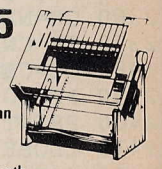

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ASK POPULAR

Is there any way to run programs written for the IBM PC on my Apple?
Steve Lichtman
Westport, CT

Yes. Several manufacturers offer auxiliary processor boards that add an 8088 microprocessor (the kind the IBM PC uses) to your Apple. The boards run both microprocessors simultaneously, so that the Apple can handle the input-output chores while the 8088 handles program execution. The boards contain or have provision for 64K to 128K bytes of RAM, and some allow the addition of the 8087 arithmetic coprocessor for faster calculations.

All 8088 boards run MS-DOS to allow IBM PC program development on the Apple. Many programs written in PC-DOS also will run, but special features, such as the PC's 10 function keys, are not supported. Additional information can be obtained from the following manufacturers:

AD8088 Processor Card ($345)
ALF Products Inc.
1315F Nelson St.
Denver, CO 80215
(303) 234-0871

88Card ($595)
Personal Computer Products
16776 Bernardo Center Dr.
San Diego, CA 92128
(619) 485-8411

My 1200-baud modem won't access any of the information networks. It will access 300-baud carriers but with a high data-error rate. I have determined that the problem is my telephone line, but the local phone company says it checks out O.K. Can you tell me what to do to get on-line? Please explain so that I can advise the phone company on corrective action.
George Muinch
Thousand Oaks, CA

Unfortunately, there's little you can do. Your present line could be picking up some electrical interference that distorts the data, or the telephone company's switching gear may induce line noise that causes data errors. In addition, noise and distortion vary with amount of traffic, time of day, and the route your call takes; it's often transmitted by satellite.

To see if the problem is just with your own line, take your computer to a friend's house and try logging on from there. If you can get on-line with less trouble, then the problem is with your own private line (and not the telephone system as a whole). It may be worthwhile to have the phone company install a new line (with a new telephone number) to your home. This isn't as extreme as it may sound: many people seriously involved in telecommunicating have a separate telephone line installed just for their computer.

If you can't log on from your friend's house either, then a new line to your house probably won't do any good; the trouble is with your local phone system. About all you can do then is complain until the quality of the service improves.

I'm looking for a way to share a GWBASIC in-house program with outside users without divulging the program code. Will compiling prevent the program from being listed, or is it true that typing "Control-Break" during execution will permit listing? Also, I've heard rumblings about a new Prolock floppy disk that prevents copying. Would you explain how this works?
Paul B. Sheffield
Salt Lake City, UT

A BASIC compiler converts the program statements (source code) into machine-language instructions (object code). The readable and listable program statements are replaced by machine code, and the "Control-Break" function has no effect.

The resultant machine code can be disassembled into mnemonic instructions, but deciphering the program requires much effort. Compiling not only adds some protection to a BASIC program, but also speeds program execution.

The specifics on Prolok technology are proprietary, so we can't say for certain how the company copy-proofs its disks. However, it's probably a safe bet that it's based on some variation of the following method, which has been talked about in technical journals: A small area on each disk is deliberately altered during manufacturing to make that one area unreliable (the rest of the disk remains error-free and reliable). Software written for the altered disk can run a simple test to make sure it hasn't been illegally copied to an unaltered disk: the software writes information—a string of zeros, for example—to the area of the disk that's supposed to be altered. If the information comes back scrambled, the software "knows" it's on an altered disk. If the information comes back unscrambled, the program "knows" it's an illegal copy on an unaltered disk. The software can be written to simply stop running at this point or even erase itself.

Prolok is a trademark of Vault Corp., Suite 500, 2649 Townsgate Rd., Westlake Village, CA 91361; (800) 445-0193.

Would you list some manufacturers who sell the more efficient Dvorak keyboards?
Ronald Fisher
Encinitas, CA

Sure. Although the Dvorak keyboard was patented in 1936, it wasn't really accepted until the personal computer boom. It was approved by the American National Standards

Ask Popular is a monthly column conducted by contributing editors Harv Weiner and Steve Ciarcia to answer general questions about small computers. Send your questions to: Ask Popular, POB 397, Hancock, NH 03449.

Institute (ANSI) in 1982. Many manufacturers now have a Dvorak option. Also, some word-processing programs offer a keyboard patch to convert to the Dvorak format. One is Volkswriter Deluxe from Lifetree Software (411 Pacific St., Suite 315, Monterey, CA 93940; (408) 373-4718).

Manufacturers of Dvorak keyboards include:

Cherry Electrical Products Corp.
3600 Sunset Ave.
Waukegan, IL 60087
(312) 578-3500

Key Tronic Corp.
POB 14687
Spokane, WA 99214
(509) 928-8000

Maxi-Switch Co.
9697 East River Rd.
Minneapolis, MN 55433
(612) 755-7660

Several months ago, my company replaced its remote terminals and offered them for sale to employees. While the terminal I purchased looks impressive, it is not very powerful. Is it possible to add economical computing capability?

Romas B. Spokas
Rockford, IL

Adding computing capability to a "dumb" terminal requires a computer. Many single-board computers that need a terminal for I/O are available. These include:

SIBEC 51
Binary Technology
POB 67
Meriden, NH 03770
(603) 448-1285

"The Original Big Board"
Digital Research Computers
POB 461565
Garland, TX 75046
(214) 225-2309

MPX-16 Single Board Computer
Z8 BASIC System Controller
Micromint
561 Willow Avenue
Cedarhurst, NY 11516
(800) 645-3479

In addition, most of the S-100-type computers, such as those manufactured by Compupro (3506 Breakwater Court, Hayward, CA 94545; (415) 786-0909) require a terminal.

Since your terminal can display only alphanumeric characters, you will have no graphics capability with any computer.

I have an NEC PC-8201A computer and want to learn how to write machine-language programs. Can you refer me to a good textbook on the 8085 Assembler Language?

David King
Milford, NY

The Intel 8085 microprocessor was designed to improve the 8080A microprocessor by increasing its speed and simplifying support circuitry. Books written for programming the 8080A will apply to the 8085.

Two such books are *8080/8085 Software Design* by David G. Larsen, Jonathan A. Titus, and Christopher A. Titus. Book 1 ($13.95) covers basic and advanced instructions, number-base conversions, command decoders, and interrupt programming. Book 2 ($12.95) continues with detailed descriptive explanations of programming and interfacing and includes serial communications, interrupt applications, system monitors, and debuggers. Both are published by Howard W. Sams & Co., Indianapolis, IN 46202; (317) 298-5400.

As a project engineer I use trigonometry daily for calculations and formulas. I have several custom programs to fit my business requirements but am having a problem with trigonometric conversions. For example, calculating the cosine of an angle is easy, but finding the inverse cosine is not possible with my Microsoft BASIC (without the ATAN function). Is there a way to accomplish this in BASIC?

Craig Horner
Forest Park, GA

The easiest solution is to obtain a new version of BASIC that features the ATAN function, more often called ATN. This will allow you to retain your custom programs and add the inverse trig functions. Otherwise, an algorithm for the calculation of the arctangent must be added to your programs as a subroutine.

Some general mathematics programs have the capability you require. One of the most popular is TK Solver (Software Arts, 27 Mica Lane, Wellesley, MA 02181; (617) 237-4000). It will solve equations of several variables and includes iterative procedures. It can also list and plot data and, with separate application packages, can handle a variety of specialized applications.

Multiplan (Microsoft Corp., 10700 Northup Way, POB 97200, Bellevue, WA 98009; (206) 828-8088) features the ATAN function and will allow you to set up equations in a spreadsheet format. This allows iterative solutions to be obtained simply by changing specific variables.

I am a high school student who has worked with computers for three years. I teach an introductory BASIC course to eighth grade students, helped computerize the junior high school office, and do considerable research on personal computers for home and business use. Two firms have asked me to help computerize their operations. I'm considering starting a full-fledged consulting business for home and small business systems. Do I need special training, or will my extensive background in computing be sufficient?

Shannon Mollenhauer
Marion, IA

It depends on the consulting job. Anyone who has the expertise to provide solutions to specific problems can be a consultant. However, consider the field you are entering. As your firm grows and you add some larger accounts, will you have the in-depth knowledge you need in accounting, finance, and multiuser systems? A good compromise would be to keep your consulting business small enough to allow time for the additional training and education you'll need in the future.

Start your business as a "sole proprietor" and keep track of your expenses. Consult a tax adviser or tax guide to determine which expenses are deductible and what your tax obligations are. Good luck! □

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4. ☐☐☐#️⃣#️⃣	9. ☐☐☐#️⃣#️⃣	13. ☐☐☐#️⃣#️⃣	17. ☐☐☐#️⃣#️⃣
5. ☐☐☐#️⃣#️⃣			

END SESSION . . .

7) End Session By Entering . . .
️⃣️⃣9️⃣1️⃣#️⃣#️⃣
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